CHEETAL

JOURNAL OF

The Wild Life Preservation Society of India

Vol. 15 No. 2

Photo by S.P. Shahi.

Wild Life Preservation Society of India

1. The aims and objects of the Society are as follows:—

   (a) To promote interest in and impart knowledge regarding the preservation and conservation of all forms of wild life, particularly among the youth of the country.

   (b) To co-operate with the Govts. of India and States and with other Societies and Institutions having similar aims and objects in working for the interests of wild life.

   (c) To assist in enforcing and actively supporting the Forest Acts, Wild Birds and Animals Protection Acts and Rules etc. of States and the Indian Arms Act and Rules in so far as they pertain to wild life and to bring to the notice of the authorities any infringement of the same and to assist in the detection and prosecution of offenders in respect of such laws.

   (d) To advise and help the Govt. and wild life administrators in the formation, maintenance and protection of Sanctuaries and National Parks, the preservation of wild life in general and rare species of India in particular and in the introduction of exotic species into the country, the rehabilitation of rare species etc. and in the revision on rational lines of the shooting and fishing rules, so as to conserve and increase wild life stocks.

   (e) To raise funds for the carrying out of the above aims and objects and to found and maintain museums, reading rooms and libraries of natural history in order to disseminate knowledge regarding wild life.

   (f) To promote sportsmanship in shikar and to recognise well regulated shooting and fishing, as a means of preserving wild life and fish so that through wise use the surplus may provide a recreational asset to the nation.

   (g) To carry out publicity and propaganda for the preservation of wild life in India by means of monographs, journals, films, film strips and other feasible methods.

   (h) To assist members of the Society in obtaining shooting and fishing facilities and facilities for viewing and photographing wild life in India.

   (i) To conduct research into the problem of Wild Life management in India, and in pursuance of this, to initiate, encourage and, where possible assist in projects for the study of threatened speceis and related subjects and to provide reference and research facilities for such work.

   (j) To carry on such other activities which will serve the above subjects.

What membership of Wild Life Preservation Society of India will entitle you to ?

1. You will become an active member of the growing group of Wild Life enthusiasts, who enjoy working for and spreading the knowledge of how to conserve India's heritage of Wild Life for posterity.
2. You will be entitled to the full use of the Library of the Wild Life Preservation Society and of its reading room.
3. You will receive a membership certificate.
4. You will receive personal Identification and Membership card.
5. You will be entitled to buy all publications of the Society at a concessional rate.
6. You will been titled to buy at concessional rates the Society's Greeting Cards, Calendars, Tie, Lapel badge and the Balance of Nature Game (specially Published in colour for its educative and recreational value).
7. You will be supplied "Cheetal", the quarterly journal of the Society free.

For membership particulars write to Honorary Secretary, Wild Life Preservation Society of India, 7 Astley Hall, Dehra Dun.

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RASHTRAPATI BHAVAN,
NEW DELHI-4

We in India are very fortunate in possessing a wide variety of flora and fauna, but unfortunately there is hardly any appreciation among our people of the bounties of nature. Thanks to the work of the Wild Life Board and the efforts of lovers of nature, we are now taking steps to preserve our priceless heritage of wild life.

I heartily welcome 'Project Tiger' which is meant to preserve this magnificent animal of India from extinction. On the occasion of the formal inauguration of this important project, I send my greetings and good wishes for its success.

V.V. Giri
President of India

———

PRIME MINISTER

Project Tiger abounds in irony. The country that has for millennia been the most famous haunt of this great animal now finds itself struggling to save it from extinction. The Project is a comment on our long neglect of our environment as well as our new-found, but most welcome concern for saving one of nature's most magnificent endowments for posterity.

But the tiger cannot be preserved in isolation. It is at the apex of a large and complex biotope. Its habitat, threatened by human intrusion, commercial forestry, and cattle grazing must first be made inviolate. Forestry practices, designed to squeeze the last rupee out of our jungles, must be radically reoriented at least within our National Parks and Sanctuaries, and pre-eminently in the Tiger Reserves. The narrow outlook of the accountant must give way to a wider vision of the recreational, educational, and ecological value of totally undisturbed areas of wilderness. Is it beyond our political will and administrative ingenuity to set aside about one or two per cent of our forests in their pristine glory for this purpose ?

Project Tiger is a truly national endeavour. It can succeed only with the full cooperation of the Central and State Governments and the support of the people. It has my very best wishes.

Indira Gandhi.

(Indira Gandhi)

New Delhi,
March 26, 1973.

VICE-PRESIDENT
INDIA
NEW DELHI
March 31, 1971

I understand that Dr. Karan Singh, Chairman, Steering Committee (Project Tiger) is formally launching a project to ensure the preservation of the tiger as an important part of the Nation's wild life. It is gratifying to know that this valuable animal which has been dwindling in numbers has attracted the attention of those concerned with the preservation of wild life in the country. I wish the Project all success.

G.S. Pathak

Message from His Royal Highness Prince of Netherlands, President World Wildlife Fund.

''This is a momentous day for the conservation of nature. Project Tiger represents the greatest effort made by any Government to save a wild species from extinction and this magnificent effort by the Government of India is an example to all the nations of the world demonstrating that the spirit of responsibility towards the natural world shown 2000 years ago by Emperor Ashoka in his famous rock edicts lives on in a nation grappling with all the problems of our modern world. The World Wildlife Fund and the International Union for the Conservation of Nature and Natural Resources are proud to associate themselves with the Project Tiger. We have appealed to the world for one million dollars to help India and we are confident that those who willingly contributed to save such great examples of man's genius as the Abu Simbol Temples will not fail to meet this great challenge to save the tiger—a magnificent and irreplaceable representative of our natural heritage.''

Project Tiger

Project Tiger was launched with the usual fanfare on the first of April, 1973 at Dhikala in Corbett National Park in Uttar Pradesh by Dr. Karan Singh, Chairman Indian Board for Wild Life and Minister for Tourism. Our Prime Minister Shrimati Indira Gandhi and Dr. Karan Singh are the moving spirits behind the movement for conservation of wild life in India. Dr. Karan Singh was mainly responsible for the inclusion of Principle 4 of the Declaration of Human Environment at Stockholm, Sweden in 1972. The Principle concerns wild life and runs:—

"Man has special responsibility to safeguard and wisely manage the heritage of wild life and its habitat which are now gravely imperilled by a combination of adverse factors. Nature conservation including wild life must therefore receive importance in planning and economic development."

Shri Ajit Pratap Singh, Minister of Forests, Uttar Pradesh welcoming the guests revealed that the boundaries of Corbett Park may be extended to Hardwar. Prince Bernhard of Netherlands, President of World Wild Life Fund who could not be present on the occasion deputed Miss Moria Warland and sent a message.

The President, the Prime Minister and the Minister for Agriculture sent messages. Profeesor Sher Singh, Minister of State for Agriculture said that the project was essentially labour intensive and it has great tourist value.

The objectives of the Project are to ensure maintenance of a viable population of the tigers in India and to preserve for all times, such areas as part of our natural heritage for benefit of education and enjoyment of future generations.

The justification of the Project is the danger of extinction of the tiger and the need of immediate measures for its preservation. According to last year's survey there are only 1827 tigers in India. The locations of the Project are Manas in Assam, Palamau in Bihar, Simlipal in Orissa, Corbett Park in Uttar Pradesh, Ranthambor in Rajasthan, Kanha in M.P. Melaghat in Maharashtra, Bandipur in Mysore and Sunderbans in W. Bengal.

For planning, co-ordination and part financing the Govt. ot India are responsible while the respective States are to execute and part finance the Project.

The Project will be run with the Co-operation of the IUCN, World Wildlife Fund and other voluntary organisations like the Wild Life Preservation Society of India and the B.N.H.S. The duration of the Project is Six years, April 1973 to March 1979 It will be executed in four phases and the estimated amount required is Rs. 58 Million, with a foreign exchange need of 1.2 Millions. The World Wildlife Fund is expected to raise a million Dollars for the Project.

The launching of Project ended with the release of 'Wild Beauty', a book of Wild Life Photographs by K.S. Sankhala, Director of Project Tiger and a vote of thanks by Shri K.L. Lahiri, Inspector General of Forests.

We wish the Project all success and assure the authorities concerned of our co-operation and help whenever and wherever needed.

Wild Life—Tourism

Another good news for the Conservationist in India is the Wild Life Tourism Development project of the Ministry of Tourism, Government of India in the next Five Year Plan beginning in April 1974. Wild Life Tourism in India is being taken up through a specially constituted Project. The Project with the help of its staff will undertake development of a wild life tourism infrastructure in specially selected areas in co-operation with State authorities.

"Items suggested for development from the point of wild life tourism in areas other than National Parks/Tiger Reserves and Wild Life Sanctuaries are snake parks, zoological parks, acquaria, sports fishing, breeding of endangered species, wild life publicity, wild life safaries, translocation of wild life species, hospitality, wild life library, seminars, exhibitions and development of trekking. A wild life loan fund to assist private enterprise in running some of the wild life tourism facilities like wild life parks, snake parks, wild life safaries, transport and catering arrangements in wild life areas has also been proposed."

The project will go a long way in preserving our natural heritage of wild life and nature and we wish the project aut success.

———

Project Tiger

CORBETT NATIONAL PARK—1.4.1973

Address by Dr. KARAN SINGH, Chairman, Indian Board for Wildlife

Man is certainly the most creative of all the many species that have inhabited this planet ever since life began many million of years ago; creative not only in as much as the population of mankind itself is increasing tremendously, but also in the deeper sense of having produced tremendous works of art and architecture and engineering and of having changed the face of this planet in many ways. And indeed with science and technical development growing apace the capacity of man to change the environment is steadily increasing, and it is a very impressive effort if you look at it over the last 5,000 years. But I think it is also true that man is perhaps the most destructive of all the species that the world has known, because in this very process of creation and of changing the environment in which he lives he has wrought irreparable and often irreversible damage to many of the natural resources which this planet possesses.

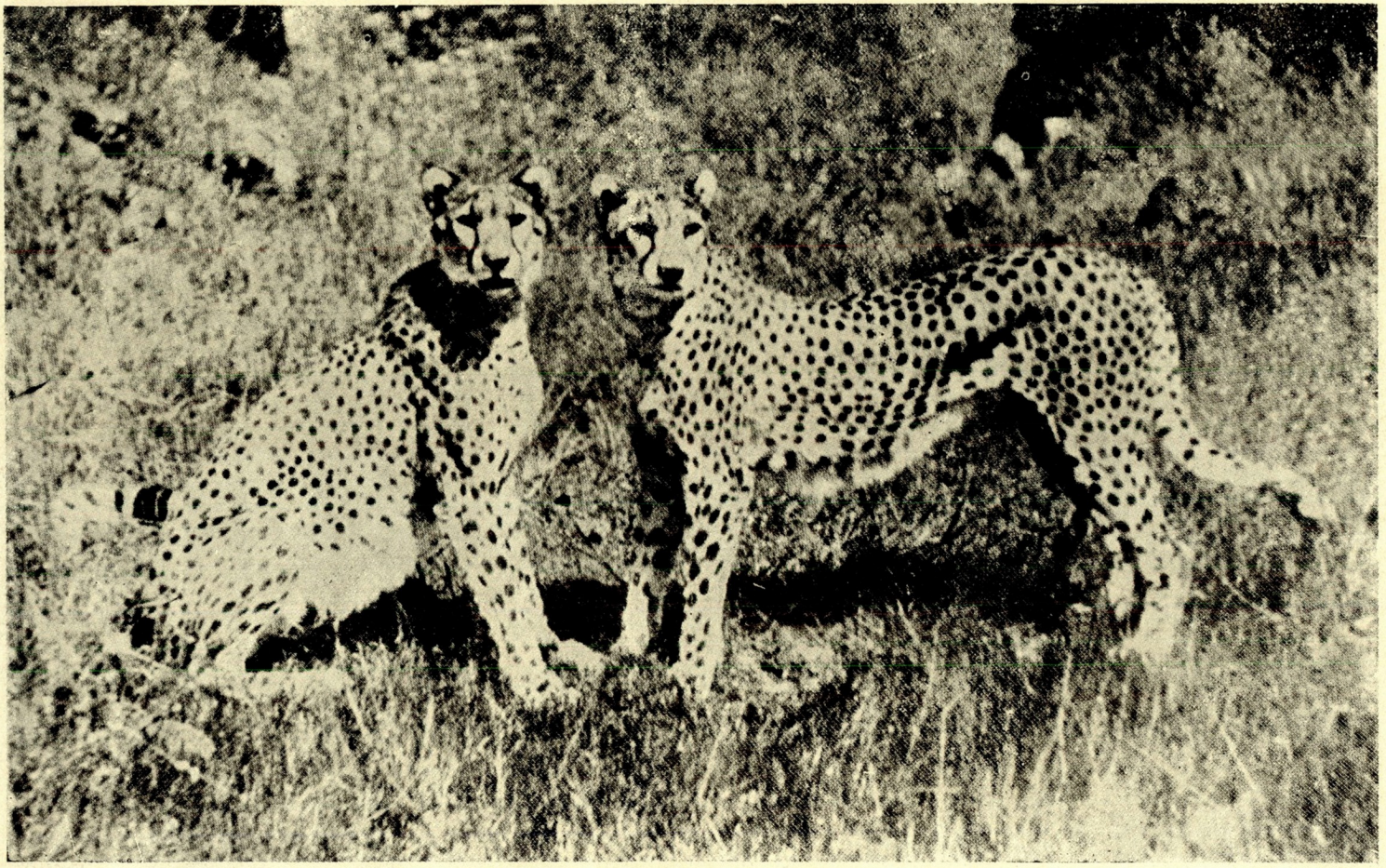
It has only very recently been realized that the planet upon which we live is a sort of a spaceship in which the resources are limited. It is not as if the resources of this planet are unlimited, they are in fact strictly limited. It is only now when a photograph of the world was taken from outer space that for the first time it was dramatically and irrefutably brought home to the consciousness of Man that we are a single eco-unit. However much we may be divided by political boundaries and geographical barriers, the fact is that from outer space our world is one unified and indivisible unit and there is now a growing awareness that unless something radical is done to reverse the process of environmental destruction and pollution, mankind itself may well be endangered much sooner than most people realize.

I had the privilege last year to be in Stockholm at the time of the great United Nations Conference on the Human Environment, and it was a dramatic and moving experience because the nations of the world had gathered there and, irrespective of political ideology or other difference, there was a unanimity of opinion that something radical had to be done to save the quality of human life and to enrich the human environment. In the developing countries, of course this is perhaps even more important, because the developing countries by definition are at a low level of economic growth and if in addition to their poverty their natural environment becomes polluted then they will really be getting the worst of both worlds. And therefore in developing nations in particular there must be a greater awareness of this. I say this because there is one view which feels that the whole ecological and environmental problem is only a sort of luxury which can be indulged in by the affluent societies. It is true that the affluent societies are rapidly becoming 'effluent' and will become more and

Launching Project Tiger at Corbett National Park

L. to R.—Shri Ajit Prasad Singh —Forest Minister, Uttar Pradesh; Dr. Karan Singh—Minister for Tourism, Govt. of India; Prof. Sher Singh—Minister of State for Agriculture, Govt. of India; Shri K.L. Lahiri—I G. Forests; Shri K.S. Sankhala—Director, Project Tiger.

Dr. Karan Singh releasing 'Wild Beauty' by Shri K.S. Sankhala



Cheetas—Now extinct in India.

more so if they do not do something about it. But I would submit that for developing societies it is equally if not more important that these environmental values must be injected into our consciousness and into our planning.

We all owe a debt of gratitude to the Prime Minister who, perhaps alone among the leaders in the developing world, has realized the tremendous importance of these environmental values and has set up, as you know, the National Committee for Environmental Planning and Co-ordination. She has taken a personal interest in this matter, and indeed this entire Project Tiger, I can assure you, would not have become a reality had it not been for the personal interest and intervention of the Prime Minister at every stage in order to see that this Project was brought forward to a point where today it is ready to be launched.

Environmental values are not something new in India. From the very dawn of our civilization there has been an awareness of this. I was going through some of the Vedas the other day and I came across a very beautiful passage in the Atharva Veda:—

यत् ते भूमे विखनामि क्षिप्रं तदपि ऐहतु,
मा ते मर्म विमृग्वरी मा ते हृदयर्मापपम् ।

(Whatever I take from the earth may that have quick growth again. O Purifier, may we not injure thy vitals or thy heart).

This was 5,000 years ago when our culture was being formed in these magnificent forests which were teeming with wildlife. It is a remarkable thing that the people at that age realized that the earth's resources were not something which could be damaged at will, and that anything taken out of the earth had again in some way or the other to be put back into it.

This is the broad background against which Project Tiger is being launched. I do not think it is necessary for me to go into details of what exactly the Project is, because those have been already mentioned by Professor Sher Singh and many of you have received a detailed note with regard to the Project. I would only like to say this that the tiger, as we see it, is a symbol of the entire ecological problem in this country. This is something which needs to be reiterated. Of course those of you who are here understand this clearly, but it is possible that there are some people in this country who may be wondering as to why in a nation when millions are still living well below the level required for a decent human existence, not sure of even one square meal a day far less two, such a lot of money be spent upon preserving the tiger. It is a good question. I know conservationists get very irritated and indignant when this is asked, but it is a question which we have got to face and which we have to answer. I do not think there is any point in trying to evade it. And the answer is very clear and very important. If a situation arises in any country where wildlife cannot exist any longer, ultimately a situation will also arise when human beings cannot exist any longer, because human beings also partake ultlimately of the same ecological

atmosphere, of the same ecological support that is required by wildlife. Unless these values of wildlife preservation are really understood by everybody, all our plans will not succeed. And that is why I want to make this appeal to our friends from the Press who are here to be kind enough to stress this point, that what we are doing is to try and preserve some areas in this country so that generations yet unborn can take advantage of these beautiful surroundings.

Apart from the fact that the tiger is our national animal and is gravely endangered, wildlife is an indicator of the environmental quality. There is the educational importance of wildlife. There are many children now who have grown up in metropolitan areas and who have never seen any of these beautiful animals. Can you imagine how impoverished our future generations are going to be if the only animals that they will ever see will be in zoos behind bars. There is the scientific importance as has been mentioned, the research into the behaviour of these species and into the entire balance of the natural system. And then there is the aesthetic and artistic importance. Particularly in this modern age, when life is speeding up and is becoming increasingly hectic, when people have less and less time to relax and unwind, if we have at least a few oases of wildlife in this country it is something which will be of incalculable value for future generations.

I would like also to add that the Project Tiger must be considered in co-ordination with the Wildlife Tourism Project that we are launching in the Fifth Plan. There is already some activity in the current Plan, but in the Fifth Plan we are launching a special Wildlife Tourism Project which we hope is going to involve 50 million rupees. This is going to cover not only the tourism requirements in these nine tiger sanctuaries, but also many other areas, for example Kaziranga, where the great one-horned rhinoceros live; Periyar, the magnificent sanctuary in the South; Dachigam up in Kashmir which is the home of the last surviving Kashmir Hangul, that magnificent stag which is on the verge of extinction. It will cover Sariska, Bharatpur and various birds sanctuaries. It will also, we hope, establish three entirely new national parks in this country—a mountain national park, a desert national park, and a marine national park. So Project Tiger with 40 million rupees and Project Wildlife Tourism with 50 million rupees between them represent the effort in the Central sector for wildlife preservation and presentation during the Fifth Plan period. In addition to this the State Governments also, we hope, will in their own plans look into those areas which we have not been able to cover.

I know some friends have come to me and said that we are choosing only nine areas and there are dozens of areas which are left out. That is true, but we have to function within the limitations of our resources. The choice before us was either to spread out the money in tiny penny packets to cover, let us say, 50 areas, or to concentrate upon 9 areas and spend more money there. And I think that we were correct in our decision that if we have to do something let us do something worthwhile rather just for the sake of saying that we have done something and then not be able to make any impact. But we do hope that

the State Governments will also budget to look after some of the otheri mportant areas that we have not been able to cover.

I must make the important point that the co-operaticn of the State Governments is absolutely essential in the success of our Project. It is true that Project Tiger will be a Centrally sponsored project, the finances will be met from the Centre and the officers will be directly under the control of the Government of India. But that is not the point. Unless the State Governments are really fully involved and committed, it is simply not possible for us sitting in our offices in New Delhi to expect that we are really going to make any sort of impact. For example, the administration of the Wildlife (Protection) Act, which was passed by Parliament last year, is entirely the responsibility of the State Governments. They are the ones who have to face the pressure and there are genuine problems which we sometimes tend to overlook. We must appreciate their difficulties also. They have to deal with the actual people who are living in the areas, whether they are Adivasis or other villagers. They have got to deal with the day to day human problems involved. But I do feel that the State Governments are gradually becoming more and more wildlife oriented, and the response that we have had so far from the State Governments on Project Tiger has been very encouraging. I am hopeful that their full and unstinted co-operation will be available to us in the administration of this Project.

I would like on this occasion to pay tribute to Professor Sher Singh and his Department of Agriculture, the Inspector General of Forests, K.S Sankhala and other officers for the very keen interest that they have taken in this Project. And I would also like to personally thank members of the Steering Committee of Project Tiger, the official members and also the two non-official members who happen to be with us this morning, Zafar Futehally who represents the World Wildlife Fund in India, and Shri M. Krishnan, the famous naturalist and scientist. These two gentlemen have given a great deal of their time and energy to us, and we are indeed grateful to them for their co-operation which, we hope, will continue in the years to come. I must also thank Miss Warland for having come half a world away to be with us on this occasion. We had invited His Royal Highness Prince Bernhard, but he has just returned from a strenuous tour of Indonesia and therefore was not able to come himself. We hope that he will be able to visit us whenever it is convenient to him, and we can assure him that when he comes here we will be glad to take him and show him what we are trying to do under Project Tiger. Miss Warland has come and we are grateful to her for having come to Corbett specially to participate in this Project.

The World Wildlife Fund is participating in a big way. Of course this project is essentially an Indian project, but almost 20% of the resources are going to be raised in foreign exchange by the World Wildlife Fund. We welcome this, not only because of the money involved but because of the international interest that this will create. After all, when each nation preserves its own heritage in a way, it is preserving it for mankind. Science and technology are developing in a way in which these political barriers will necessarily have

to break down by the end of the century. I am one of those who is convinced that the very compulsion of events is such that by the year 2000 the political system in the world is going to be very different from what it is today. We may still have the nations and we may still have individual sovereignty, but if mankind is to survive at all it will have to work in much closer co-ordination than it does at present. And I like to look upon Project Tiger as a symbol, as it were, as an advance action of this international co-operation which is going to become so important in the years and decades ahead.

All over the world today people are interested in this Project because the World Wildlife Fund is raising resources for it. So, the tiger today has become not only a symbol for India, not only our national animal, not only our pride, but it has become a symbol of the entire world's interest in wildlife preservation and environmental quality. And it is, therefore, in this broader context and dedicated to the broader aim of preserving for generations yet unborn their magnificent natural heritage, that I have tremendous pleasure in formally launching Project Tiger.

———

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Honorary Secretary.

New Game Laws need a change in the Nation's Outlook.

The wild life is not abundant to-day, and needs strict protection. Help us in checking illicit shooting and netting etc.

We have to conserve the natural forests—the home of wild life; the water resources and provide peace and tranquility for their growth and healthy living.

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Pay a visit and enjoy the scenic beauty, the variety of wild life and jungle life.

Chief Wild Life Warden,
Uttar Pradesh,
LUCKNOW.

Wild Life Preservation Society of India

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"Carrying Capacity"—and India's Wildlife

BY

M. KRISHNAN

The concept of carrying capacity, popular among theoretically-minded conservationists today, is by no means modern, and goes back to the empirical knowledge of livestock breeders. It is a logical concept, based on certain presumptions from which mathematical calculations are made cautiously, allowing various margins of safety. Reviewing my field experience of our wildlife in many different parts of India over the past 25 years and more, it seems to me that carrying capacity calculations as now made, are capable of leading one to fallacious conclusions (the risk in logic is always fallacy) and that it can be positively dangerous to place over-much reliance on such reckonings in planning our wildlife conservation.

In saying this, I must make three things unmistakably clear. First, I fully appreciate the fact that informed naturalists (as opposed to armchair experts) do not think of carrying capacity calculations as infallible or irrefutable figures, but only as a method of estimating the capacity of an area to support animal populations that is more reliable than an educated guess. Second, I write exclusively with reference to India's wildlife : elsewhere, where conditions are different or more artificially sustained, such reckonings may have a more realistic value. Third, I am all for trying to gain a better knowledge of the needs of our flora and fauna—this is no biased comment on a sound, scientific method by an old-fashioned crank, but the questioning of the soundness of a method, currently very much in vogue in our country, by a scientifically educated naturalist, solely in the interests of scientific integrity.

The method now in use of determining the carrying capacity of any tract with regard to a particular wild herbivore inhabiting it, may be summed up as follows. The perimeter and area of the tract are first determined, and the vegetative tracts within it assayed; then, by means of transects, samplings, or more comprehensive estimates of the vegetation, the quantity of fodder available during the leanest times of the year in this tract is calculated,

and on the bases of the daily intake of each individual of the species and the total population of the species in the area, the gross daily (or periodic) requirements are arrived at. Refinements of this method are parametric calculations based on unit mass of fodder and unit mass of the species being studied in some convenient term—for instance, one metric ton (tonne).

Another mode of estimating carrying capacity which is broader in its base and not confined to a particular species, currently in vogue in Africa and America, is the estimation of it in terms of biomass. Biomass has been defined as "the weight of a population of organisms per unit area"—in practical terms and in the context of this note, that would mean to total estimated weight of the herbivores of a preserve, in stock-units of 1000 lb. (or one tonne) per square mile or square kilometre, determined as closely as possible and for a specific period or particular time. This ratio, considered along with another or other similar area or areas supporting the same herbivores, gives one an objective basis for comparison.

Elaborate precautions are taken at each stage of such calculations, and contingent allowances made so as to invest the estimates with a reasonable measure of dependability. For example, what is felt to be "due allowance" may be made for infant and juvenile populations of a species during a period (the period under survey), or for births and deaths, climatic variations and aberrations and seasonal floristic changes. And what are sought to be determined from the statistics collected are not hard-and-fast figures, but only trustworthy estimations. All this sounds so eminently reasonable that one might well think that such estimates just cannot be out, or anyway, far out. Such a confidence, however, is based largely not on the over-all truth, but on the compelling verisimilitude of logical and logistic arguments, and the verisimilitude of the many allowances made at each stage, after the basic presumptions. I question the bases originally presumed and not the subsequent, careful calculations, the fundaments and not the superstructure, with specific reference to India's wild herbivores.

My misgivings in this matter may now be set out briefly, with illustrative examples from actual field observations.

The entire question of carrying capacity arises only when artificially imposed depletions and imbalances have already upset the balance of nature in a preserve. This is provably so. Imagine an adequate tract of forest where there has been so little human interference that the flora and fauna have subsisted naturally for years: obviously, there is no need for any strenuous effort on our part, by means of elaborate assumptions and laborious calculations from the limited data at our disposal, to determine the carrying capacity of the tract—the balance of nature that has maintained itself in the area all these years can safely be trusted to look after itself.

It is only when by human occupation or exploitation of a forest that the area becomes incapable of sustaining its wildlife (especially, when human activities in it have resulted in exotics invading the forest, or when its vegetative resources have been seriously depleted by intensive grazing or plantation work) that we begin to think of carrying capacity—and to the extent to which we are willing to have faith in our calculations of carrying capacity to remedy the situation, we betray our wholesale lack of faith in the recuperative power of nature. Is it not an indisputable fact that in our country today, in no sanctuary or faunal area has nature been given a chance to recoup by the area being freed of all human demands upon it ?

To assess the carrying capacity of any sanctuary worth the name in our country and to try, by means of "controlled cropping" to limit the fauna within that calculated capacity, is a classical instance of putting the cart before the horse. Today, the tendency of many of our pundits, wherever there has been a serious upset of nature caused by human activities, is not to remove those depletory human influences but to limit the fauna to the estimated carrying capacity. Further, the tendency is to explain aberrant faunal behaviour not as a consequence of the depletive influences in the area, but as something caused by the too insufficient carrying capacity of the land ! For example, the rampageous behaviour of wild elephants has been attributed to insufficient fodder in places where human activities have not only depleted the native vegetation but also rendered life insecure and constantly disturbed to the animals !

In our preserves today, few of which are free from the depletions and imbalances introduced by human activities, the vital and most urgent necessity is efficient protection and the elimination of these deleterious human influences. Until that is done, and some time has elapsed thereafter, it would be idle to compute the carrying capacity of the area—and if such protection and withdrawal of adverse human influences results, as I think they must, in the wildlife settling down more or less, there would be no need for any computation.

Even after all allowances are made, the determination of carrying capacity depends on the presumption that a determinable population of several species of animals inhabits a known area for a period (say, a year) and that they feed efficiently on the available fodder. Every field naturalist knows that this is not so—and, fortunately, cannot be so, for otherwise our natural flora, which is as integral a part of our wildlife as the fauna, would have disappeared long ago.

Actually, most herbivores require a considerable range, even the less far-ranging of them like cheetal and sambar (X gaur and elephants). While it is true that within a large tract their feeding is conditioned by the availability of the best feeding locations (which keep changing with seasonal floristic and other changes), it is also true that they do

not make the most efficient and intensive use of all such grounds, and that many other factors also condition their feeding.

In India, wild elephants in herds do not stay in the same area for any length of time. They arrive at a forest, and depart from it, mainly along the well known 'elephant walks' which are their established tribal travel routes (and not merely the routes followed by particular herds)—though, where they are much harassed by humanity, they may leave these old trails and shift "to fresh fields and pastures new" near human habitations which were originally part of the elephant country. Another herd may have preceded a herd feeding in an area, or may succeed it there; when feeding, a large herd breaks up into parties and the members of each party keep together, but the parties themselves separate (though they reunite periodically), and leave sizeable areas of rich vegetation untouched in the course of their traverse of a feeding ground—their feeding is extensive and somewhat haphazard, and not intensive. Further, elephants where free from human disturbance feed most economically, and only when near-human presence panics them, do they lay waste to entire fields, trampling down much more than they eat. Such rampageous behaviour and general aggressiveness towards man and his artifacts is the direct consequence of human usurpation of the immemorial homes of elephants, the constant disturbance and harassment caused by men, and the blocking up of their age-long travel routes by human agriculture and holdings. It has been estimated that an adult elephant consumes about 200 kg. of green fodder everyday: a herd with 20 adults in it would need, on this reckoning, no less than 4 tonnes a day, and in a month would demolish an entire forest. How is it, then, that at no time in the history of this ancient land has any single tract of forest been denuded by large herbivores such as elephants and gaur, when men have laid waste to a hundred square miles of forest within 2 years ?

Before answering this question, I must firmly scotch the wholly misconceived claims of some men who say that wild elephants have laid waste to forest tracts in recent years. Where men have invaded elephant forests extensively and intensively (as in the Moyar-Masinagudi area of the Mudumalai sanctuary and the periphery of the Periyar sanctuary), constantly disturbing the great beasts and blocking up their 'walks', elephants do indulge in destructive activity, in their frustration, perplexity and panic. The fact remains that in the course of countless centuries not one acre of natural forest has been destroyed or depleted beyond redemption to its pristine luxuriance by wild elephants in India.

This is so because elephants feed extensively and somewhat at random, as already said, and it is no less so because their normal fodder is made up of renewable and annually renewed plant parts such as twigs and leaves, the aerial shoots of tall grasses and bamboos, fruits and even bark that is, surprisingly, renewed (as in the case of *Kydia calycina*). If elephants and gaur did not range far and shift feeding grounds periodically, and if the regeneration of the plants they feed on is not so much quicker than our computations

suggest, so many forests would certainly have been destroyed by them—as they have been by men.

Furthermore, although they are the largest of land animals and spend most of their waking time feeding (elephants, unlike ruminants, feed slowly and continually, and not in intensive bursts) elephants do not always eat the most luxuriant or nutritious bulk fodder available. I have seen wild elephants laboriously gathering the minute, pink flowers of *Mimosa pudica*, spending ten minutes to get a tiny morsel in their trunk-tips. It is not only elephants that behave like this. Experienced naturalists know perfectly well that at times herbivores are not to be found where the vegetation is lush and rich, but in areas where what there is, needs to be sought and found laboriously. Sambar, for instance, spend days nibbling at the 6-inch-high sprouts of up-and-coming grass in the black, fire-charred floor of deciduous hill-forests in February, when a little farther down there is fresh green fodder in bulk.

We should know much more about the feeding habits and gustatory preferences of our herbivores (whether such preferences are induced by seasonal vegetative changes, or by the compulsion of consciously ununderstood bodily needs) before we can afford to compute their needs. Everyone knows that at times elephants ingest the basal portions of the sheaves of dusted grass they place crosswise in their mouths, and at times the distal green blades, sometimes rejecting the blades and sometimes the stalks (culms): one might conclude, logically, that it is a question of whether the green blades are fresh and comparatively free from silica, and whether the culms are starch-rich, that decides their preference in this matter. After having closely studied the portions of the sheaves that elephants reject in the course of such feeding, and also the clumps of grasses in their feeding grounds, I am sure it is difficult for a man to know what exactly guides their preferences—unless he were a grass-eater.

Some forest fruits are avidly eaten by most herbivores when in season, such as ber (*Zizyphus* sp.), *Grewia* spp., *Diospyros* spp., *Gmelina arborea* and many legumes. The power of these trees and shrubs (and of many herbs, too) to attract herbivores when they are in fruit, is seldom taken into reckoning in computing carrying capacity.

When the sour drupes of *Spondias mangifera* are ripe, and when *Melia composita* is in bitter fruit, muntjac are drawn irresistibly to the trees; the fruit of *Terminalia bellerica* attracts sambar, and all deer love the round fruits of *Randia dumetorum*, noxious to man (even *Randia uliginosa* has to be sliced thin, washed carefully and then boiled to be fit for human consumption). There are, of course, a great many more fruits, and even flowers, that attract many animals and even jungle-living humanity. Is all this taken into account in reckoning carrying capacity, and in delimiting the periphery of the range of animals in an area ?

Even if allowances were made painstakingly, for all such known attractions, they may not always be realistic. I have seen a hill-forest carpeted 6-inch deep with bamboo seed, with not even junglefowl attracted to the feast. Thc weevils had taken over.

The reverse of such factors, not attraction but repellence, is much more important in assessments of faunal life. This has not even been thought of in the concept of carrying capacity. There are exaggerated notions current about the power of the dhole (wild dog) to drive away all other animals when they enter a faunal area, but even taking legend at face value, the dhole is certainly a long way behind man in the power to scare away forest animals. W ild animals just cannot stand men on foot (in India) and where noble sportsmen hunt them from jeeps with searchlights, they are terrified of motor vehicles, too. In areas where there is much hunting and poaching, or where these were major factors affecting the fauna till recently, such as in Orissa, Andhra Pradesh, parts of Bihar and parts of Uttar Pradesh, even animals that are largely diurnal where they are not disturbed, like cheetal, sambar, and gaur, have turned into fugitive creatures of the night that flee at the sight or smell of man, and shelter in cover all day, coming out only with dusk and retreating into cover at dawn. Even otherwise, cover is one of the primary requirements of most wild animals, and when sheltering in cover they do not feed much—even where the cover is edible, their retreat and feeding urges and behaviour are different. Has this vitally important factor, cover, been taken into consideration in reckoning carrying capacity ?

I may end this by repeating what is really important in wildlife conservation in India. It is not management technique today, but protection from every kind of hunting, and human depletive influences, whether or not these are intended.

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A Study of the Breeding Biology of Birds of the Sunderbans Forests

By

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AND

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ABSTRACT

The vast expanse of mangrove swamps, studded closely with a net work of tiny islands of mud flats, supporting low wooded forests of very high density and virgin beauty, have been chosen by several species of water and marsh birds as their breeding habitat. The authors chose a representative section of such an area in the Sajnakhali Wild Life Sanctuary for the study of the habitat and the breeding behaviour of the Open-bill stork, the Large egret and the Little cormorant. It covers some behavioural and functional roles of plant and animal communities that form an integral part of the entire ecosystem of the Sundarbans It includes nests and pattern of nesting, laying of eggs, hatching, growth of fledglings, food and food habits, action of predators, parasitism, mortality and survival patterns of the birds. Common information relating to the birds, that are obtainable in text books, have not been described. The data in this article are the result of three seasons' study which is to be continued. Here, the breeding behaviour of these three widely occurring species of birds are expected to differ from those elsewhere because of the peculiar nature of the terrain.

1. INTRODUCTION

In recent years there has been considerable interest in the study of the breeding biology of Indian birds. Although some work has been done on (i) the Little Cormorant (*Phalacrocorax niger* Vieillot), (ii) the Open-bill stork (*Anastomus oscitans* Boddaert) and (iii) the Solitary Large Egret (*Egretta alba* Linn.), the present study has been undertaken in great detail as the situation of the breeding site was found advantageous for such a study. It was intended to ascertain if the locality factors have any bearing on the breeding biology in such an uncommon habitat. The paper reflects the various qualitative and quantitative aspects and the habitat of the above three bird species in the Sajnakhali Wild Life Sanctuary.

The Sanctuary which is a part of a vast ecosystem peculiar to the mangrove forests, has numerous species of water birds (some of which are resident), mammals, water and land lizards, snakes, crocodiles, sharks and very many species of fish, crustaceans and molluscs and many other species of lower groups of animals.

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2. HISTORY

The reserved forests of the Sundarbans cover an area of 4,17,126 hectares cut up by innumerable streams and water courses. The maximum concentration of the breeding birds has been at the Sajnakhali Wild Life Sanctuary, though there are three other spots of smaller concentrations. All these breeding grounds have been selected at the fringes of the forests, facing villages. The breeding areas were spread over about 360 hectares in the Sajnakhali Wild Life Sanctuary. This place has been the large scale breeding grounds of birds since 1955.

The three species of birds viz. the Little cormorant, the Open-bill stork, and the Large Egret, are the principal visitors during the months from June to September. Night herons are also regular visitors but not a single nest was seen during 1971 although a good number bred during 1970. The reason is not apparent. Other bird species that visited the Sanctuary during the period of study were herons, egrets, paddy birds, darters, one or two individuals of spotted pelicans, but none built nests.

3. OBJECT OF STUDY

The object of study was primarily two-fold. Firstly, it was intended to study the main structure and gradients in the plant and animal communities of the ecosystem in this mangrove forest; secondly, it was designed to study the sexual, parental and ingestive behaviours with stress on nest construction and pattern, egg-laying, brooding, fledging mortality, training and other related aspects of the lives of the three species of birds. It was possible to ascertain the trend of the survival pattern of the birds. Simultaneously, a population count has also been attempted. It is expected that the present study will help in planning the management of the Sanctuary to meet the optimum needs of various species of birds and other big and small animal populations.

4. METHODS OF STUDY

A well represented portion of the nesting areas was selected and fifty well dispersed trees with nests of the three species of birds, were marked serially. The nests on each such tree were given a sub-number and observations were made daily for a period of 90 days, from nesting to the final flight of the fledglings. Eggs in each nest and fledglings were marked and numbered with different colours.

Observations were made from fixed and portable ladders, fixed towers and from boats at high tide; a binocular (prismatic) of 11 × 50 was used for such observations. Actual measurements and weighments of nests, eggs and fledglings were made by the use of tapes, divider and spring balance, and tabulated in charts specially made for the purpose.

5. HABITAT

The plant and animal communities, both form a complex habitat in the entire ecosystem of the Sundarbans forests and are described as follows:—

5.1 **Plant Community**

The low lying swampy islands cut up by innumerable streams and creeks are inundated daily during high tide. The water is brackish and the forests are low and poor. Most of the trees, except *Sonneratia apetala*, are hardly 10 metres tall, but very dense and almost impenetrable. Water-logging, salinity, high humidity, soil devoid of humus, surface soil, at places full of decaying molluscs, annelidas, larvae and exuviae of insect are the salient features of the forests.

The forests are of two principal types viz. (a) Salt-water *Heritiera* type and (b) low mangrove type. The principal formations under these types are:

5.1.1 *Heritiera minor-Phoenix paludosa* formation

Night herons have been found to build breeding nests, in large numberson *Phoenix paludosa*. No such birds were found doing so in 1971.

5.1.2 *Heritiera minor-Excoecaris agallocha* formation

No nests have been observed on *Heritiera* or in this formation.

5.1.3 *Heritiera minor-Excoecaria agallocha-Cereops roxburghiana* formation

No nests have been observed in this formation.

5.1.4 *Pure Phoenix paludosa* formation.

Except night herons no other birds have been found to select this formation for building nests.

5.1.5 *Pure Cereops* formation

Such areas are practically devoid of nesting birds. In 1969 and 1970, not a single nest was found on *Cereops* but, in 1971, nine such trees with nests were observed.

5.1.6 *Avicennia alba—Oryza coarctata* formation

Avicennia alba and *A. officinalis* trees are obvious choices for the nesting of breeding birds. The maximum number of nests are built on these two species. The crown of *Avicennia* trees appears most convenient for nest construction. *Oryza coarcatata* is a grass one metre tall.

5.1.7 *Avicennia* sp.—*Sonneratia apetala* formation

It is not known why *Sonneratia* is not selected as a nesting tree. No nests were seen on this species. *Sonneratia* is absent from the study area but present elsewhere in the forest fringes.

5.1.8 *Rhizophora mucronata—Bruguiera gymnorhiza* formation

No nests have been seen in this formation. Individually *Rhizophora* does have nests, as in the Sajnakhali Sanctuary (0.8% of host plant).

5.1.9 *Excoecaria agallocha—Cereops roxburghiana* formation

In this formation *Excoecaria* has nests. The breeding areas of the Sajnakhali Sanctuary show that the birds prefer *Avicennia* trees (83.4%), then *Excoecaria* (13.7%), while *Rhizophora* (0.8%), *Xylocarpus* sp. (1.8%) and *Aegiceros* (0.3%) have very few nests on them. Birds other other than Night herons have a disinclination for *Phoenix*. There is a complete absence of ground flora in the locality. This helps the Openbills and Egrets to retrieve the dropped food during low tide.

The habitat hectarage for the census area was as follows:—

Census area	*Oryza coarctata* and tidal flat	*Avicennia* area	*Phoenix* area	*Cereops* area	Mixed crop	Blank and other areas	*Excoecaria cereops* mixed crop
360.0 Hec.	4 Hec.	100 Hec.	80 Hec.	56 Hec.	20 Hec.	20 Hec.	80 Hec.

6. ANIMAL COMMUNITY AND THE ENVIRONMENT

The habitat of the breeding birds in the present site is a complex one. Strong winds (mechanical environment) and rain affect the nests and birds; salinity (chemical environment) affects the source of food collection, the low tide provides mud banks for some food and space for training, high tide reduces the space and brings the aquatic animals close to the breeding birds. Most important is the association of various animals and birds in the breeding sites. Though not directly connected or concerned with the breeding birds, monkeys (*Macaca mullata*), spotted deer, pigs, various species of fish, fauna, sharks, and crocodiles (estuarine) occur in the area. Most harmful are the presence of the Jungle crow, osprays, buzzards, owls and wild cats, in the area. Most harmful among the reptiles are land and water lizards (*Varanus* species) and some snakes. Several species of molluscs and Crustaceans form the food of the breeding birds including various sweet water fish. Tigers also track the area in search of men and animals; they prey upon injured birds that fall to the ground and stomach analysis have shown half disintegrated feathers and beaks.

7. HOST PLANTS

Avicennia is the tree species of obvious choice. One *Avicennia* tree with a crown of 12 sq. metres had 34 nests of all the three species of birds; many nests touched each other and there

was perfect balance and co-existence among different species. In 1970, actual counting revealed 336 nests on 50 well dispersed trees, while in 1971, 500 nests were counted on 50 well dispersed trees. The following statement shows the percentage of host plants:

Tree species	Precentage of host tree in breeding areas	Species of birds that built nests
1. *Avicennia* sp.	83.4	All species of birds
2. *Excoecaria* sp.	13.7	Openbill Stock only
3. *Xylocarpus* sp.	1.8	-do-
4. *Rhizophora* sp.	0.8	-do-
5. *Aegiceros* sp.	0.3	-do-

Most of the nests were hardly 3 metres above ground level.

8. NESTS

8.1 **Their Construction**

Nest construction starts from the first week of June and continues for 10-15 days in each case; but as new pairs regularly come and construct nests, the entire operation lasts for 1-2 months. Egrets and cormorants construct their nests once for all and after hatching of the eggs, repairing stops; but in the case of Openbills, patch-repair of the nests continue, till the fledglings are ready for their final flight.

Soft and leafless branches of *Excoecaria* are the principal nest-building material. The next choice is *Avicennia* with a fair percentage of *Phoenix* (Cormorants and egrets avoid this). The fibrous nature of leaflets is no hindrance to the collection. Branches of *Derris*, *Cereops* and *Xylocarpus* have been found in the construction. Green leaves are used as a soft cushion for egg-laying. This is more rigidly observed by the Openbills than the others.

As the nests are constructed very close to each other, there is hardly any reconnaissance for site selection. The nests are built 3-5 metres above the ground, but at high tide they are hardly 2 metres above the water surface. Nest building continues throughout the day by both the parents till the laying of eggs. Openbills come first, followed by egrets while cormorants come last. Fresh nests are built every year.

8.2 Nest Size

The following are the sizes of nests of different types of birds.

Species	Size of nests in centimetre			Weight of nest in grams	Period taken to construct nest in days
	Length	Width	Circumference		
1. Openbill stork	45	36	130	1,200	15
2. Large egret	45	40	126	1,146	14
3. Little cormorant	30	30	120	580	12

N.B. The figures are averages of 10 nests of each species selected at random among 150 nests measured.

The nests of the cormorants are more compact and neater than the others. The Openbills are rather careless and docile birds and their nests are comparatively delicate and are prone to storm and other damage. There is, however, great uniformity in the construction of nests.

8.3 Fate of Nests

The table shows the fate of different categories of nests:

	In percentage			Remarks
	Openbill	Large egret	Little cormorant	
1. Nests with viable eggs which hatched successfully	50.5	58.0	81.0	
2. Nests destroyed by storm	21.0	23.0	9.0	
3. Nest deserted	18.5	9.0	nil	Reason unknown
4. Nest with dead embryos	10.0*	10.0*	10.0*	

*In the severe storm of September, 1970 about 10% of the nests were destroyed and many fledglings died in the nest due to cold and starvation.

The desertion may be due to death, either of the parents being trapped in the villages or killed by lizards.

9. EGG LAYING, HATCHING AND TRAINING OF FLEDGLINGS

Eggs are not found in all nests. The reason may be that either the male of female birds are killed during food collection or eggs are eaten by predators.

9.1 Date range of the laying of eggs (Graph-1)

Observations were made on 150 nests in three species of birds and random selection of ten nests of each species were made and the date range was noted as follows:

Species	Openbill	Egret	Cormorant	Remarks
First lay	1st day	1st day	1st day	
Second lay	3rd day	3rd day	3rd day	The peak period o laying is from 22.6.71. to 7.7.71.
Third lay	5th day	5th day	5th day	
Fourth lay	7th day	7th day	7th day	
Fifth lay	9th day	—	9th day	

N.B. It was only when the eggs were destroyed, that a few pairs of openbills were found to have 6th or 7th lays but this happened rarely.

9.2 The size and weight of eggs

This is shown in Table 1. As the size and weight of the eggs did not differ much among the individuals of each species, fractional measurements have been avoided. Such fractions would not have given any special indications.

9.3 Incubation period

This is calculated as the interval between the laying of the first egg till its hatching. The pattern is as follows:—

Species of birds	Incubation period in days	Weight of eggs in grams	Weight of nestling on hatching in grams
1. Openbill	31	60	60
2. Large egret	21	40	40
3. Little cormorant	28	20	20

The time taken by different species of birds from hatching till flying stage is reached is as follows:—

Species of birds	Start of first flying in days after hatching	Final flight from nests in days	Remarks
1	2	3	4
1. Openbill	37	47 to 52	After leaving the nests, the fledglings stay on for a month on the tree top before leading independent lives.
2. Large egret	37	47 to 52	
3. Little cormorant	23-27	33 to 42	

Between the start of first flying and the final flight from the nest, cormorants train their fledglings in water once, for an hour, in the morning during low tide. The Openbill and egret fledglings hop about from tree to tree, following their parents. Egret fledglings also go to the mud banks with their parents during low tide. Openbills prefer the tree tops.

Table II shows the incubation period and weight at hatching of a few fledglings. Fractions in weight have been rounded up.

9.4 **Pattern of laying eggs.** (Graph—2)

More than 300 nests were examined and the pattern, as percentages, was found as follows:—

Species	Number of eggs in each nest (in percentage)					Remarks
	1	2	3	4	5	
1. Openbill	17.2	33.4	30.3	18.0	0.7*	In 90% of the cases, eggs were laid on alternate days
2. Larget egret	26.4	19.8	40.6	6.6	6.6	
3. Little cormorant	9.0	27.0	27.0	37.0	—	

*Among openbills, the 6th and 7th hatch covers 0.4%.

What are the reasons for such differences in the clutch size ? Could it be (i) physiological capabilities of egg production, (ii) eggs that can be covered by incubation surface (iii) adjustment by natural selection to balance the mortality in the species and the number of young for which the parents can provide enough food ? These have to be studied.

9.5 **Replenishment of lost eggs**

Eggs lost to predators are not replenished by re-laying in all cases. It has been found that such replenishments take place at early stages of laying to the extent of only 13.2% and mainly by the openbills and rarely by the egrets. Damage is rare in the case of cormorants.

9.6 **Growth and development**

Table III shows the growth rate of the fledglings from hatching to final flight. A few selected nests have been chosen at random for this purpose. The total and periodical growth rates hove been represented on graph (Graph 4 and 5).

10. PARASITISM

Not a single case of nest parasitism has been observed, either inter-specific or intra-specific.

11. PREDATORS

Land and water lizards and Jungle crows are the worst enemies of the eggs, nests and fledglings. The population of crows is kept at a very low level by shooting them down but the shooting of lizards is banned and therefore there is no check on their predatory but the activities.

Actual counts supported by footprints have resulted in the assessment of 73 (seventy-three) lizards of three species viz. *Varanus salvator* (water lizards), *V. flavescens*, *V. bengalensis* (land lizards) and they numbered 41, 25 and 7, respectively.

The following methods were adopted for the enumeration of different species of lizards (*Varanus* spp.):—

1. Counting of footprints.
2. Visual observations by way of actual counting.
3. Sight records of the different species when they mounted the trees during high tide, from boats and observation towers.

Several staff members were stationed at different vantage points along the entire boundary of the breeding area. Observations were made twice a week for 4 weeks by all the three methods described above.

The following are the details of observations and enumeration during the aforesaid eight times.

	1st	2nd	3rd	4th	5th	6th	7th	8th
V. salvator	40	41	35	41	38	41	39	41
V. flavescens	23	24	25	25	24	25	24	25
V. bengalensis	5	7	6	7	7	7	6	7

The counting of foot prints was made during low tide. Visual observations were easily made during high tide since the entire erea could be negotiated by boats, and sight records at tree heights were facilitated by the fact that the lizards mounted the trees during high tide. *V. salvator*, being large in size (1 to 1.5 metre) were easily identified.

The lizards were found climbing trees most efficiently and the *Cereops* bushes suited them most, others less, and *Phoenix* least. The spreading crown of *Avicennia* afforded them a concentrated supply of food as the lizards could select eggs and fledglings of all sizes. Lizards have been observed damaging the eggs and fledglings in nest after nest and the openbills in large numbers were helpless and silent spectators against these powerful predators. The lizards were more active during low tide.

The following statement shows the loss of eggs, nests and fledglings due to predators and other reasons:

(Observation on 150 nests).

	Openbill	Large Egret	Little Cormorant	Remarks
1	2	3	4	5
1. Number of nests examined	81	44	32	
2. Number of eggs counted	288 (3.6 per nest)	133 (3 per nest)	119 (4 per nest)	These figures show that cormorants are most efficient.
3. Number of eggs lost to predators	119 41.3%)	40 (30.0%)	23 (19.3%)	
4. Fledglings destroyed	25% of hatched eggs or 42	20% of hatched eggs or 19	15% of hatched eggs	
5. Survival per cent of fledglings	35.4% or 127	45.7% or 77	70.2% or 82	

Damage to fledglings is very little. The survival figure among the different species of birds is quite high considering the survival percentage of various other species of animals and birds. (Group-3).

The survival of the fledglings within the whole of the Sajnakhali Sanctuary is as follows: –

Species	Nests	Eggs	Fledgling that finally survived	Days from hatching to flight
1	2	3	4	5
1. Openbill	4334	15602	6878	50
2. Large egret	226	678	393	50
3. Little cormorant	215	860	593	40

12. FEEDING INTERVAL

The birds have a habitual dislike for brakish water food and they travel 3-6 miles or more on each occasion to collect food from sweet water marshes. The rate of feeding the fledgling, therefore, slows down. The following are the feeding intervals:—

Species	Age of fledglings				Remarks
	1st & 2nd week	3rd week	4th week	5th week	
1. Openbill	4 times	3 times	3 times	3 times	There is no fixed time of feeding.
2. Large egret	4 ,,	3-4 ,,	2 ,,	2 ,,	
3. Little cormorant	4 ,,	3 ,,	2 ,,	2 ,,	

On moonlit nights birds of all the species collected food from village marshes but not frequently.

Mouth-feeding is done by the egrets and cormorants. Fledglings thrust their entire head into the mouth of their parents and collect food. In the case of openbills, however.

the broken shell of the molluscs are regurgitated on the nests and the fledglings collected food from the nests. Cormorants and Egrets have been found to eat fish viz. puti, tengra, koi, khalsi, chingri, parse, mourala, and baingon but the openbills feed mainly molluscs.

13. FOOD & FOOD HABITS

Although the openbills have been found to take food other than gastropods, the present observations show that 90% of the food consisted of the latter.

The Little cormorants were found to take fish mostly; small amounts of crustaceans, frogs, water insects, molluscs and vegetable matters have also been observed in their diet.

The following data have been recorded by A.K. Mukherjee of Zoologycal Survey of India.

	Percentage of wt. of commercial fish in relation to total wt. of food	Percentage of wt. of crustaceans in relation to total wt. of food	Total
1. Openbill	4.59	25.37	2 .96
2. Large egret	72.00	3.00	75.00
3. Little cormorant	91.09	0.87	91.96

13.1 Analysis of food contents

3.1.1 Little cormorants:—Almost 100% of the food consisted of fish. The daily consumption by the 430 adults and about 593 fledglings in the breeding area would be as follows:—

(i) By the adults—100 Grams. × 430 or 43,000 grams.

(ii) By the fledglings—30 Grams. × 593 or 17,790 grams.

Therefore, the consumption of fish during (i) 100 days of the breeding period, by the adults is 43,000 Kg. (ii) 40 days by the fledglings is 7116 Kg. (Adults food consumption of 100 gm has been quoted from A.K. Mukherjee's Ph.D. thesis).

This shows that the Little cormorant is harmful to pisciculture.

13.1.2 Large egrets:—They also chiefly eat fish and the consumption by 452 adults and 393 fledglings would be about another 50,000 Kg., during the breeding period.

This species is also harmful to pisciculture.

13.1.3 Openbills

An analysis of the food contents made by A.K. Mukherjee's of the Zoological Survey of India indicates the following:—

Mollusca	—	53.64%	Insects	—	4.35%
Crustacea	—	25.37%	*Oligochaecta* (earth worm)	—	2.09%
Reptiles (Snakes)	—	7.40	Fish	—	4.59%

Amphibia (toads & frogs)—2.55%

This species, it seems, is beneficial to pisciculture.

The above calculation has not taken into consideration the food consumed by the fledglings that have died during development. It has also not taken into consideration the food consumed by the fledglings during the post-nesting stage in the forests. The above estimate is, therefore, rather conservative.

14. ASSESSMENT OF POPULATION

The following statement shows the result of a total count of nests in the study area (360 hectares):

Species of birds	Number of trees used for nests	Number of nests	Number of parent birds
1. Openbill	411	4334	8678
2. Large egret	59	226	452
3. Little cormorant	43	215	430

This shows a total of 9,560 birds that bred in the Sajnakhali Sanctuary; on Swan Island, 1500 breeding Openbills were counted; in Herobhanga and Ajmalmari blocks 500 Openbills were also counted. It was, therefore, found that in the breeding season of 1971, about 11,560 breeding birds came to the reserved forests of the Sunderbans. There were, however, about 1000 stray Openbills counted on different trees at Sajnakhali Sanctuary, which did not have any nests. This brings the total to 12,560 in the reserved forest area—a very conservative estimate.

The Sajnakhali Sanctuary produced 6864, 338 and 329 new fledglings of the openbills, egrets and cormorants respectively, to flying stage in the 1971 breeding season.

Taking another 10% as casualties during the period of stay in the Sanctuary till migration, the total number that left the Sanctuary and its neighbourhood at the end of the breeding season was around 21,000 birds.

Appendix I

ITEMS OF FOOD OF THE BIRDS (Obtained fro n the Ph. D. Thesis of Dr. A.K. Mukherjee of Z.S.I.)

Openbill	Large egret	Little cormorant
1. Reptiles: *Ptyas mucosus*, *Natrix piscator*	1. Reptiles: *Acrochordus granulatus*, *Natrix stolata*	1. Reptiles: Nil
2. *Amphibia*: *Rana tigrina*, *Bufo melanostictus*	2. *Amphibia* Nil	2. *Amphibia*: *Rana* sp.
3. *Pisces*: *Channa punctata*, *Anabas testudineus*	3. *Pisces* *Pangasius panagasius*, *Mystus gulio*, *Mystus* sp., *Aplocheilus panchax*, *Anguilla bengalensis*, *Muraena tile*, *Muraenesox cinereus*, *Skongylura strongylura*, *Chelon* sp., Several other species	3. *Pisces*: *Mystus gulio*, *M. vittatus*, *M.* sp., *Chela* sp., *Puntius sarana*, *P. ticto*, *Catla catla*, *Labeo bata*, *Mugil tade*, *Anabas testudeneus*, *Channa punctata*
4. *Mollusca*: *Pila* sp., *Viviparus bengalensis*, *Melanoides* sp., *Lymnaea* sp.	4. *Mollusca*: *Lymnaea* sp., *Nerita* sp. *Viviparus bengalensis*, *Melanoides* sp., *Pila* sp.	4. *Molusca*: *Melanoides scabra*, *Lymnaca acuminata*
5. *Crustacea*: *Scylla serrata*, *Paralelphusa jacquemonti*	5. *Crustacea*: *Metapennaeus* sp , *Scylla serrata*, *Varuna litterata*	5. *Crustacea*: *Macrobrachium lamarrei*, *Metapeneus brevicornis*
6. Insects: Grass-hopper, Crickets, Long-horned grasshoppers	6. Insects: *Ceriagrion* sp., *Crocothemis* sp., *Pantala* sp., Several other species	

Table—I

The size and weight of eggs and nests

Nest No.	Serial Number of egg	Circumference in cm.		Size & Wt. of nests in cm. & gm.	Wt. of eggs	Remarks
		Individual of egg length × width	Average			
1	2	3	4	5	6	7
		Little cormorant				
I	1	12×10		25×32 580		
	2	12.5×10.5		25×30 580		
II	1	12×10		30×30 570	20 gm.	As there si striking uniformity, only average data of all the three species are shown in the Table.
	2	12×10	12×10	32×30 580	in Av.	
	3	12×10		30×30 590		
III	1	12.5×10		30×30 570		
	2	12×10		30×32 580		
	3	12×10		30×30 590		
		Openbills				
I	1	16×14		45×36 1200		
	2	16.5×14		35×35 1150		
	3	16×14		45×36 1200		
II	1	16×14		30×32 1250	60 gm.	
	2	16×14	16×14	45×36 1250	in Av.	
III	1	16×14.5		40×36 1300		
	2	16.5×14		45×36 1200		
	3	16×14.5		45×36 1100		
		Large egret				
I	1	15×12		40×45 1140		
	2	15×12		45×35 1190		
II	1	15.5×12		45×40 1150		
	2	15.5×12		45×35 1140	40 gm.	
	3	15.5×12	16×14	45×40 1100	in Av.	
III	1	15×12.5		45×40 1140		
	2	15×12		45×40 1160		
	3	15×12		45×40 1130		

Table II

Incubation period and weight at hatching of a few fledglings

Nest No.	Serial Number of egg	Wt. in Gram of eggs at laying	Dates of		Incubation period	Wt. in grams of fledglings at hatching; individual Wt. in gm.	average
			Laying	Hatching			
1	1	3	4		5	6	
			A. Little cormorant				
1	1	20	24.6.71	24.7.71	30	20	
	2	20	27.6.71	25.7.71	28	20	
	3	20	30.6.71	29.7.71	29	20	20
	4	20	2.7.71	30.7.71	28	20	
2	1	20	30.6.71	28.7.71	28	20	
	2	20	2.7.71	30.7.71	28	20	
	3	20	4.7.71	2.8.71	28	20	20
	4	20	6.7.71	4.8.71	28	20	
3	1	20	22.6.71	19.7.71	28	20	
	2	20	24.6.71	21.7.71	28	20	
	3	20	26.6.71	23.7.71	28	20	20
	4	20	28.6.71	26.7.71	28	20	
	5	20	30.6.71	28.7.71	28	20	
4	1	20	24.6.71	21.7.71	28	20	
	2	20	26.6.71	23.7.71	28	20	
	3	20	28.6.71	26.7.71	28	20	20
	4	20	30.6.71	28.7.71	28	20	
	5	20	2.7.71	1.8.71	29	20	
5	1	20	24.6.71	23.7.71	29	20	
	2	20	26.6.71	25.7.71	29	20	
	3	20	28.6.71	30.7.71	28	20	
	4	20	30.6.71	30.7.71	30	20	20
	5	20	2.7.71	29.7.71	27	20	
	6	20	4.7.71	2.8.71	28	20	
6	1	20	22.6.71	21.7.71	29	20	
	2	20	24.6.71	24.7.71	30	20	
	3	20	26.6.71	24.7.71	28	20	20
	4	20	28.6.71	26.7.71	28	20	
7	1	20	22.6.71	21.7.71	29	20	
	2	20	24.6.71	24.7.71	30	20	20
8	1	20	26.6.71	24.7.71	28	20	
	2	20	28.6.71	26.7.71	28	20	

	2	3	4		5	6	
			B—**Openbills**				
1	1	60	28.6.71	28.7.71	30	60	
	2	60	30.6.71	1.8.71	31	60	
	3	60	2.7.71	3.8.71	31	60	60
	4	60	4.7.71	4.8.71	30	60	
2	1	60	24.6.71	24.7.71	30	60	
	2	60	26.6.71	27.7.71	31	60	
	3	60	28.6.71	29.7.71	31	60	60
		60	30.6.71	31.7.71	31	60	
3	1	60	24.6.71	24.7.71	30	60	
	2	60	26.6.71	26.7.71	30	60	
	3	60	28.6.71	29.7.71	31	60	60
	4	60	30.6.71	31.7.71	31	60	
4	1	60	24.6.71	24.7.71	30	60	
	2	60	27.6.71	28.7.71	31	60	60
	3	60	30.6.71	31.7.71	31	60	
5	1	60	28.6.71	28.7.71	30	60	
	2	60	30.6.71	2.8.71	32	60	60
	3	60	3.7.71	4.8.71	31	60	
6	1	60	8.7.71	7.8.71	31	60	
	2	60	11.7.71	9.8.71	30	60	
	3	60	14.7.71	13.8.71	31	60	60
	4	60	17.7.71	15.8.71	30	60	
7	1	60	28.6.71	29.7.71	32	60	
	2	60	2.7.71	1.8.71	31	60	
	3	60	4.7.71	5.8.71	32	60	60
	4	60	6.7.71	6.8.71	31	60	
8	1	60	24.6.71	26.7.71	32	60	
	2	60	27.6.71	28.7.71	31	60	
	3	60	30.6.71	2.8.71	32	60	60
	4	60	3.7.71	4.8.71	33	60	

1	2	3	4	5	6

C—Large egret

1	1	40	14.6.71	5.7.71	21	40	
	2	40	16.6.71	7.7.71	21	40	40
2	1	40	24.6.71	14.7.71	21	40	
	2	40	26.6.71	16.7.71	21	40	40
	3	40	28.6.71	18.7.71	21	40	
3	1	40	20.7.71	11.8.71	22	40	
	2	40	22.7.71	12.8.71	21	40	40
	3	40	24.7.71	14.8.71	21	40	
4	1	40	20.7.71	10.8.71	21	40	
	2	40	24.7.71	13.8.71	21	40	40
5	1	40	24.6.71	14.7.71	21	40	
	2	40	26.6.71	16.7.71	21	40	40
	3	40	28.6.71	18.7.71	21	40	
6	1	40	24.6.71	14.7.71	21	40	
	2	40	27.6.71	17.7.71	21	40	40
	3	40	30.6.71	22.7.71	23		
7	1	40	24.6.71	14.7.71	20	40	
	2	40	26.6.71	15.7.71	19	40	40
	3	40	28.6.71	18,7.71	20	40	
8	1	40	24.6.71	14.7.71	20	40	
	2	40	26.6.71	15.7.71	19	40	40
	3	40	28.6.71	18.7.71	20	40	
9	1	40	24.6 7 1	14.7.71	20	40	
	2	40	26.6.7 1	16.7.71	20	40	40

A—Little cormorant

Weight of fledglings from hatching to final flight
(Two representative nests selected out of 32)

Nest No.	Age in days	Weight in grams of fledglings			
		1	2	3	4
1	1st day	20	20	20	20
	4th ,,	40	40	40	40
	7th ,,	60	60	100	100
	10th ,,	80	100	160	200
	13th ,,	200	150	220	320
	16th ,,	280	200	300	410
	19th ,,	340	300	400	500
	21st ,,	375	390	480	590
	25th ,,	450	435	540	680
	28th ,,	530	500	570	740
	31st ,,	—	550	—	—
*Weight Index		4.0	3.6	3.7	2.7
VIII	1st day	20	20	20	—
	4th ,,	40	60	60	—
	7th ,,	100	130	100	—
	10th ,,	200	180	150	—
	13th ,,	320	230	220	—
	15th ,,	410	290	310	—
	19th ,,	500	380	400	—
	22nd ,,	590	470	450	—
	25th ,,	680	520	510	—
	28th ,,	740	580	580	—
	31st ,,	—	—	660	—
*Weight Index		27	3.7	3.0	

*Weight on the first day expressed as a precentage of the weight on the final day.

B—Openbills

Weight of fledglings from hatching to final flight.

Nest No,	Age in days	Weight in grams of fledglings			
		1	2	3	4
I	1st day	60	60	60	
	4th ,,	120	100	100	
	7th ,,	180	140	150	
	10th ,,	260	200	210	
	13th ,,	380	280	290	
	16th ,,	480	390	370	
	19th ,,	590	480	480	
	22nd ,,	680	600	580	
	25th ,,	770	720	700	
	28th ,,	890	810	800	
	31st ,,	980	920	910	
	34th ,,	1060	1030	1020	
	37th ,,	1120	1170	1200	
	40th ,,	1200	1230	1230	
	43rd ,,	1280	—	—	
Weight Index		4.7	4.9	4.9	
VIII	1st day	60	60	60	60
	4th ,,	90	100	120	120
	7th ,,	110	150	100	150
	10th ,,	140	210	240	220
	13th ,,	200	320	310	300
	16th ,,	260	400	390	400
	19th ,,	340	490	470	490
	22nd ,,	420	580	570	560
	25th ,,	520	680	660	640
	28th ,,	590	720	760	720
	31st ,,	660	880	810	810
	34th ,,	750	920	900	900
	37th ,,	840	1020	980	960
	40th ,,	920	1100	1080	1080
	43rd ,,	1000	1200	—	—
	46th ,,	1100	—	—	—
Weight Index		5.4	5.0	5.5	5.5

C—Large egret

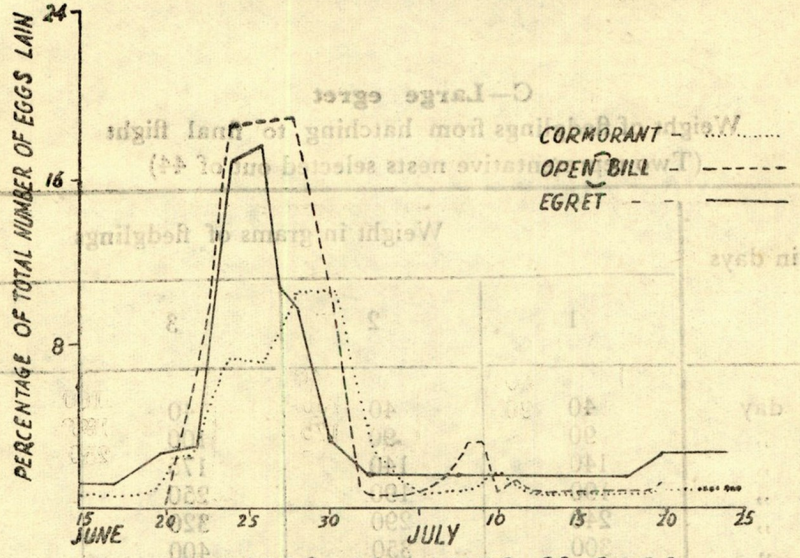
Weight of fledglings from hatching to final flight

(Two representative nests selected out of 44)

Nest No.	Age in days	Weight in grams of fledglings			
		1	2	3	4
	1st day	40	40	40	40
	4th ,,	90	90	100	100
	7th ,,	140	140	175	180
	10th ,,	190	190	250	250
	13th ,,	240	290	320	310
	16th ,,	300	350	400	380
	19th ,,	365	410	490	450
	22nd ,,	430	485	570	550
	25th ,,	480	520	610	610
	28th ,,	540	565	680	700
	31st ,,	620	600	710	720
	34th ,,	700	700	760	790
	37th ,,	790	780	800	final flight taken place
Weight index		5.0	5.1	5.0	5.0
VIII	1st day	40	40	40	40
	7th ,,	100	110	100	90
	10th ,,	180	190	175	120
	13th ,,	250	230	250	195
	16th ,,	330	300	325	250
	19th ,,	390	360	385	310
	22nd ,,	440	410	450	400
	25th ,,	500	480	500	500
	28th ,,	600	540	600	580
	31st ,,	680	610	690	610
	34th ,,	720	700	720	650
	37th ,,	750	740	—	700
	40th ,,	—	760	—	860
Weight Index		5.3	5.3	5.5	5.0

PEAK PERIOD OF LAYING OF EGGS

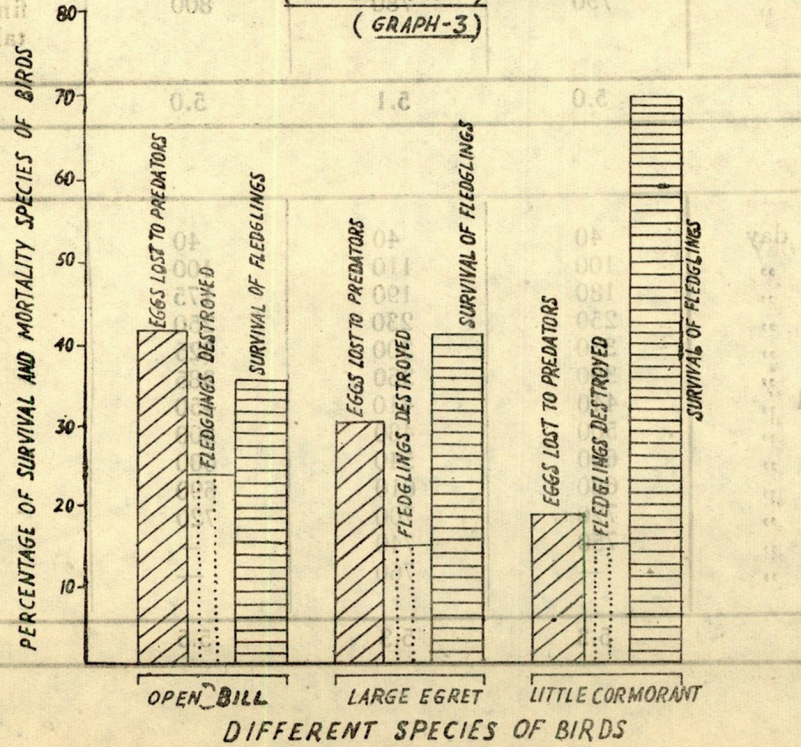
(HATCHING CURVES SHOW SAME TEND) GRAPH-1.



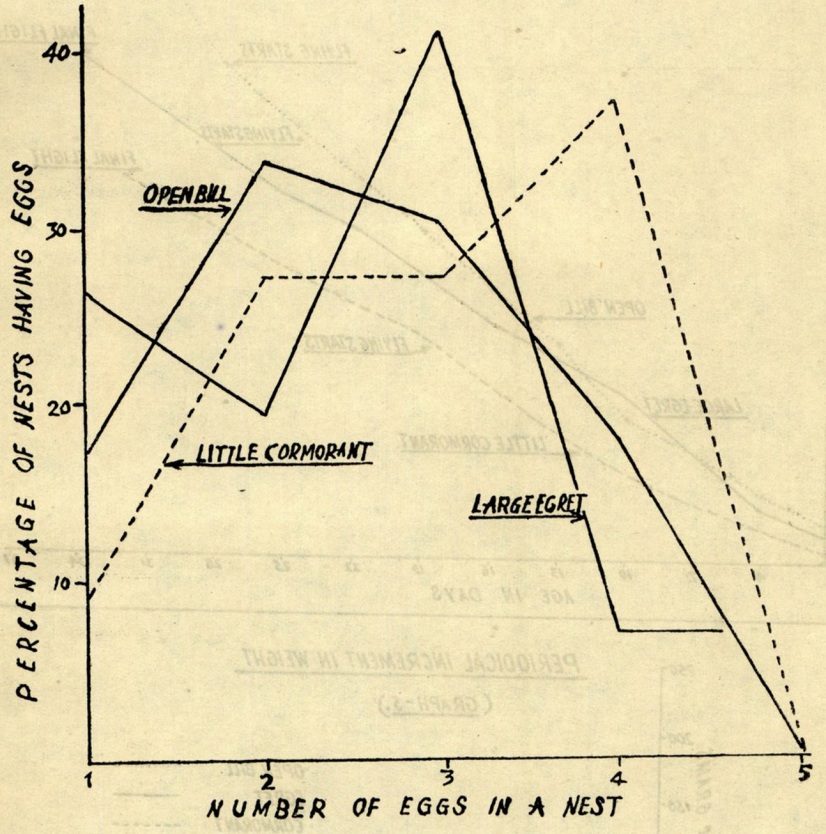
HISTOGRAM SHOWING SURVIVAL OF BIRDS

(IN PERCENTAGE)

(GRAPH-3)



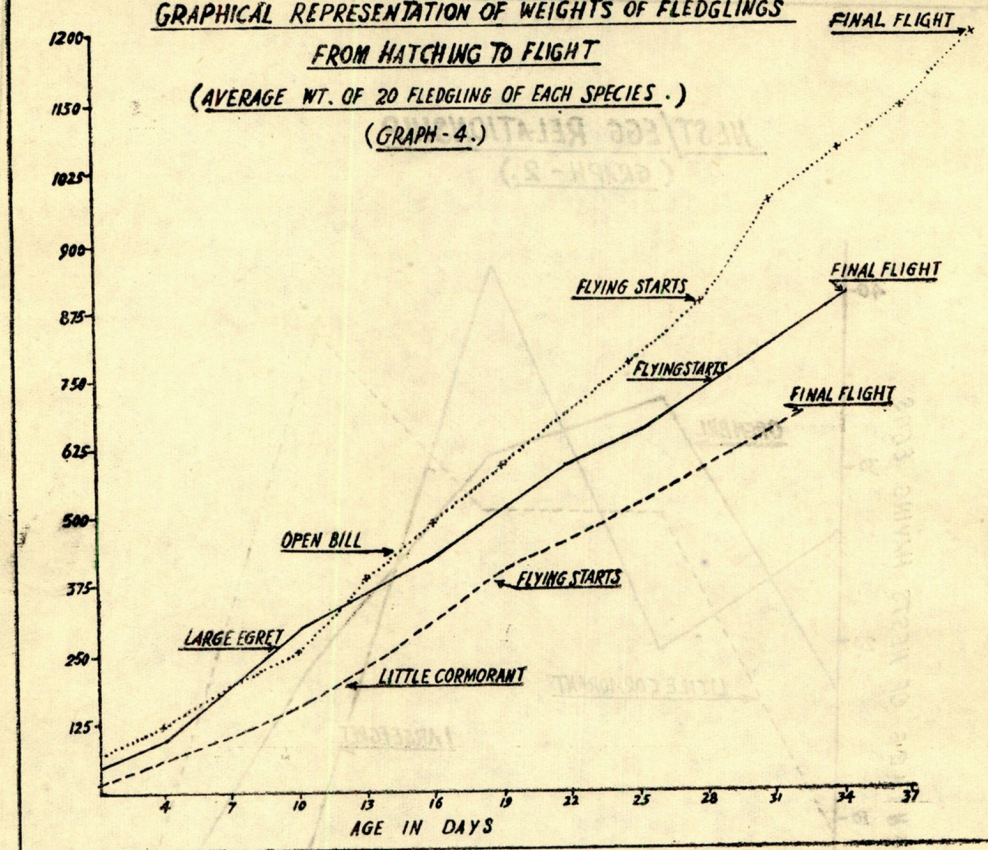
NEST/EGG RELATIONSHIP
(GRAPH - 2.)



GRAPHICAL REPRESENTATION OF WEIGHTS OF FLEDGLINGS FROM HATCHING TO FLIGHT

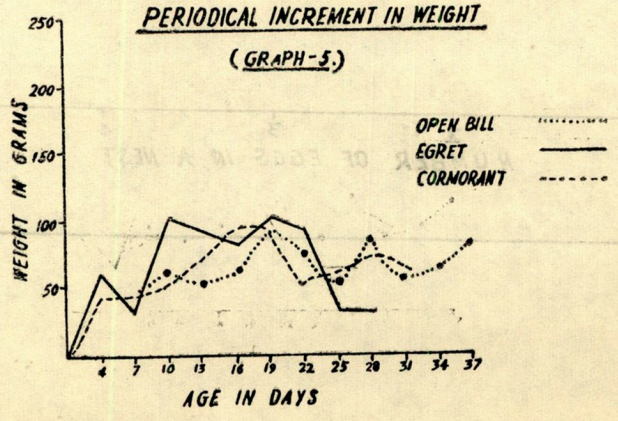
(AVERAGE WT. OF 20 FLEDGLING OF EACH SPECIES.)

(GRAPH-4.)



PERIODICAL INCREMENT IN WEIGHT

(GRAPH-5.)



15. CONCLUSION

It would be worthwhile to pursue the present work at an interval of every 3 or 5 years for better and indepth refinement of the study. It may lead to the evolution of methods to regulate the bird population and predators and manipulate the environment as far as practicable to suit the needs of the wild life.

16. ACKNOWLEDGEMENTS

The authors are thankful to Dr. B. Biswas of the Zoological Survey of India, for his encouragement in pursuing the work. They also offer their sincere appreciation for the frequent and valuable suggestions given by him. They are also thankful to Shri B.N. De, Conservator of Forests, Central Circle, for frequent encouragement. Extensive field data have been collected by Sarvashree S.P. Anjoy and C. Jha, Foresters, whose efforts and help are gratefully acknowledged.

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Save the Tiger in Rajasthan

By

Gopal Singh

According to the latest official census it is claimed that in the State of Rajasthan there are now only 40 to 50 tigers. During the last 10 to 15 years hardly any deaths of these animals have been officially reported and still their population is rapidly shrinking. Obviously, no proper control over shooting or poisoning has been maintained as a result of which we have come to a point where we are facing their extinction. This is quite an alarming situation and unless positive steps are taken we may very soon reach a point of no return in so far as tigers in Rajasthan are concerned.

When the different states of Rajputana merged into what is now Rajasthan State, one of the proud legacies that the rulers left behind was the extremely well preserved fauna and flora in their individual states. It is a pity that the succeeding government never fully appreciated this heritage and things were allowed to lapse and deteriorate.

Having lived and travelled very extensively in Rajasthan for many years it would be no exaggeration to say that in 1947-1948 the area comprising the states of Alwar, Jaipur, Karauli, Dholpur, Kota, Bundi, Tonk and Udaipur, the adjoining Rampura and Bhaupura districts of Indore State and Sheopur, Shivpur, Guna and Gwalior districts of Gwalior State, had easily a population of over 600 tigers. It was all once a contiguous belt. Even in my own Kota State and its environs there were at least 80 tigers and from the records available with the present Maharao Sahib of Kota it would be revealed that 25 tigers a year was the annual crop keeping in view the healthy carrying capacity of the local tiger habitat. I had once the privilege of counting nine adult tigers in a single beat and the occurrence of 4 to 5 tigers in a single beat was a common feature. Before 1947 so good was the balance of wild life that there were no complaints of man-eaters or man-killers. There was room for everybody to live happily and human and wild life stock were very much complimentary and not so competitive as today.

But those wonderful days in the very nature of the political changes that swept the area were bound to change. There was at once a great influx of human population from out side and there was a consequent demand for more land for cultivation, fuelwood and timber. Speaking of my own Kota District which once had the finest tropical tiger habitat in Rajasthan, the plentiful agriculture land freely available was most generously and thoughtlessly given away for cultivation. In the wake of unplanned land distribution, people took the liberty of trespassing wherever they liked. In the absence of organised land distribution, taking into consideration the larger interest of forest retention and selection

of feasible lands for agriculture, some of the best forests were hacked away. Many of the so called 'landless' indiscriminately felled timber, made money and disappeared, and invariably in such cases the best forests were sacrificed. Since there was no restriction on hunting and poaching, the poor wild animals were the worst sufferers and were driven further and further into the fast shrinking hinterland. Under such conditions the tiger—the aristocrat of our jungles, was hardest hit.

In the wake of deforestation, as men moved in for cultivation large herds of livestock followed them. There existed no pasture lands as such to sustain large herds of cattle and their consequent deep foraging into the hinterland, made big inroads into the tiger habitat, particularly along rivers and streams in the summer time. Here, in Rajasthan, the acute water shortage in the summer forces wild and domestic animals to streams and water holes where the wild animals were the worst sufferers. Wanton killings have been going on at the water holes without any control and checks.

Further, the large influx of graziers from Ajmer Merwara, who have permanently been allowed to settle in some of the best tiger habitats has further disturbed the wild life. This has been accentuated by repeated famines in Rajasthan which have invariably sent in thousands of famished cattle to the fast dwindling forest areas which completely disturbed the ecological conditions of the tiger habitat. The increase in human and cattle population due to better medical and veterinary facilities has further aggravated the deteriorating condition of our forests.

Pressed from all directions, deprived of its natural food, shade, cover and water the poor tiger has been driven hither and thither to find a congenial habitat which for all practical purposes has almost ceased to exist. There are now hardly any free ranging areas left for it to live in peace and multiply. This enforced nomadic existence hits a tigress with cubs, the hardest. There is neither time nor place for peaceful regeneration. Left with no wild herbivora for food, many tigers in their struggle for existence have died at the hands of poachers or poisoned by graziers. Thus unseen and unknown several animals have been killed of which there is no record. The demand for tigers skin in foreign countries has further contributed to their decimation.

With the rapid disappearance of their habitat and the likelihood of the situation worsening in the near future it is really a big problem to hold on to the present population, much less enable them to increase their numbers. The question therefore naturally arises how do we begin their preservation. I shall therefore put forward a few practical suggestions which if properly implemented should help in saving our tiger for our future generations.

The first and foremost point that comes to mind is to forcefully regulate the destruction of forests which constitute its habitat and reduce human and livestock trespassing into the

forest. Adequate mobile staff with powers to implement forest rules and regulations in the quickest possible time, is most necessary.

Wherever necessary the forest rules should be immediately revised with a view to plugging the loopholes in the present legislation. It would be necessary to recruit a trained team of dedicated and experienced workers who are ready to live with the wild animals and maintain an all time surveillance over their movements. To-day the tigers have more or less disappeared from our open forests and are presently confined mostly to wild life Sanctuaries. Some of these Sanctuaries like Dara in Rajasthan are too small and extremely vulnerable to human and cattle trespassers. Tiger breeding in such restricted places is going to be a difficult task and hence it is desirable to extend the boundaries of such Sanctuaries wherever it is possible to do so.

In order to create a better prey-predator ratio for the tiger inside wild life sanctuaries, effort at multiplication of wild herbivora such as sambar, cheetal, nilgai and wild pigs should be taken up immediately, by creating better ecological conditions. The large scale planting of such useful trees as "*Bassia latifolia*" (Mohwa), "*Zizypus jujuba*" (Ber), "*Phyllanthus emblica*" (Aonla), "*Diospyros malanoxylon*" (Tardu), *Carissa karadas*" (Karonda), "*Tamarindus indica*" (Imli), *Terminalia balerica*" (bahera) plus a broadcasting of seed of wild legumes will go a long way to improving the total and varietal food supply. This aspect has an important bearing on the eventual aim of restoring the area into a self contained unit in which herbivora may flourish and tigers find adequate food, without making themselves vulnerable by straying away from the protected zones. Since wild boars multiply the fastest and form the most savoury meal of a tiger, special attention may be given to their multiplication.

Along with the augmentation of food supply it must be seen that water is available in adequate quanlities to all the wild animals within the entire range. Cattle should be kept away from all drinking places as they often concentrate at the water holes, ruining the peace of the area particularlg during the summer when water is scarce. They not only compete with the wild herbivora for food but spread foot and mouth disease and rinderpest the two most dreaded pestilences of the herbivora. Peace at water holes or along streams is a very important factor for after a heavy meal a tiger loves nothing so much as a peaceful midday seista, close to a stream in the shade of "*Arundo donax*" (reeds), "*Engenia operculata*" (wild jama) or "*Carissa karandas*" (Karonda) bushes having an occasional dip whenever the heat or flies torment him. For the dry months this is a very important factor. It must not be forgotten that the ancestal home of the tiger was a much cooler place than the tropical heat of Rajasthan.

Today the problem of wild life preservation has become very acute on account of the conflicting interest of conservatiouists and pastoralists. But surely, the preservation of game

communities can help us to derive greater economic benefit than rearing unproductiture cattle which are allowed to multiply to the detriment of human interest, chiefly on emotional and religious grounds. There must be a check on the excessive damage that the increased livestock population is causing to the natural environment. Indiscrimate livestock grazing has already ruined our woodlands and the quality of vegetation, including grasses, has been regressing and slowly getting more and more unproductive. An aerial photograph of forest villages will reveal a general 'dying off' of vegetation on the outer periphery of the wild life sanctuaries. This must be halted, otherwise, it wan't be long before the habitat distruction will over take the last refuge of the tiger...our small sanctuaries where our only chance of saving the beautiful tiger exists.

True that with our increasing human population the preservation of wild life is an uphill task but as a farmer I feel it is high time that concentrated efforts were made to increase the food production in the dry areas under cultivation. With only 5% to 10% increases in well water irrigation and 30% to 40% increase in food production in the unirrigated area by improved farming techniques, hundreds of areas of land can be made surplus and be transplanted and reclaimed as forest land. This has been successfully implemented in the U.S.A. It will indirectly solve onr acute problem of soil erosion and arrest the lowering water-table.

In India we have some unique species of wild animals like the black buck, cheetal, the barasingha, the gour etc., of which undoubtedly the pride of place goes to the tiger. Having seen a lot of wild animals in their natural habitat I can commend that no greater thrill is so deeply satisfying and exciting as the sight of a beautiful and majestic tiger gliding silently through deep forests and its movements heralded to the whole wild world by monkeys on tree tops, peafowl and cheetal on the ground. In its home no other wild animal receives such royal attention in its sylvan surroundings, as the tiger. One has to see all this to believe, and one who has seen will forever become an ardent spokeman for the conservation of this noble animal—the pride of our country.

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Man and the Environmental Crisis

By

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Primitive man in the Old Stone Age was an integral part of his environment. He was a food gatherer. He depended mostly on animal life for a livelihood and the human population of about ten million then, was in perfect ecological balance with nature. Civilized man took to agriculture and domestication of animals. He sought emancipation from his total dependence on the environment. This primitive farming economy no only increased his food supply but decreased his death rate. The population became more numerous during the New Stone Age starting some 10,000 years ago. Since then, man has become the ecological dominant in most parts of the earth. Man has blundered into sevral crisis problems as a result of his upsetting the ecological balance with his environment. Let us assess the enormity of these various crisis problems of the human environment that threaten man's continued existence on the earth.

Population Explosion

Man has now realised that the alarming rate at which the human population is increasing is the greatest threat to him. Before the beginning of the Industrial Revolution around 1750 A.D., the world population was about 700 million. The ppoulation is now about 3.5 billion and is increasing at the average rate of 2% per year. In less than 30 years from now, around 2000 A.D., we will beatwice os many as we are now and 600 years hence there will be only one person per square yard of the earth's entire land area.

The development of our Scientific—Technological—Industrial Society which began to emerge with the onset of the industrial revolution was the fundamental cause of lowered death rate accounting for the population increase. It is particularly ironic that good medicines and public health are the primary causes of that major social 'diiease' which is the unprecedented increase in the World's population. There is no escape from a vigorous global policy to contain the "population explosion."

The Food Problem

One of the biggest problems facing mankind today is to increase the amount of food available per person in the non-industrialized countries. About 50% of the World's population go to bed hungry everyday. Despite our enormous efforts at growing more food, the quantity produced lags behind the increase in population. The outlook on World food production is alarming. In some of the most heavily populated areas, the outbreak of serious famines within the next five to ten years cannot be excluded. We should not

place too many hopes on the "green revolution", for whatever progress a country makes in the matter of growing more food will be of no avail unless the birth rate is well under control.

The Dwindling Natural Resources

The natural resources of man are also being depleted at a fast rate. Deposits of gold, silver, copper, iron, etc., cannot be replenished after they are mined. Surface deposits were soon depleted, and man had to embark on ever-more complex operations of mining and explorations in distant areas and even under the seas.

Forests on hilly terrain where the soil was not suited for crops at the outset, have been frequently cleared for agriculture. And when rainfall is relatively high in such places, erosion will follow. The top soil will be washed down the streams, ruining the fertility of the soil. As erosion proceeds, the soil becomes too poor to support crops. Such land is then used for grazing and if it is overgrazed, the remaining top soil wiil also disappear along with most of the surviving vegetation. In some regions of the World, the final indignity to the land is performed by goats, which graze more closely on poorer vegetation. The end result is a wasteland.

Many authorities state that dwindling quantities of usable water pose a more serious threat than the eventual disappearance of coal and iron deposits. A plant requires about 1000 pounds of water to produce one pound of food. Industries are using large quantities of water and it is predicted that they will require twice as much water in 1980 as is being used at the present time in some of the developed countries. Added to this is the extra need of water for washing, drinking and cooking. Water resources are fixed and there is no possibility of making any more in large quantities. In fact about 97% of all water is in the sea and about 2% is locked up in glaciers and ice caps, leaving only 1% of this undervalued commodity in circulation as fresh usable water. The World will never run short of water if our water resources are properly managed, but if not, we can expect water problems to grow increasingly severe with the further growth of human population and further industrialization.

Forests provide the most efficient trap for rain and have long been the sources for timber and fuel. But it is unfortunate that forests the world over are still being cut faster than they are being replaced, in efforts to grow more food for the surging human population. Vast areas in the Middle-East, North Africa and India are now deserts or semi-deserts because open forest and bushland have been cut down to start cattle grazing. Such destruction of forests has taken place throughout history. Properly managed, forests can enrich human life in a variety of ways, both material and psychological. Poorly managed, they can be the source of disruption for the environment of an entire region.

All over the world, wild creatures are rapidly diminishing in numbers due to modern man's encroachment, destruction of their habitats and indiscriminate killing. Since the time of Christ, over a hundred species of mammals and a similar number of birds have become extinct. Many hundreds of species are currently in danger of extinction. It would be most unfortunate if future generations of man were denied first-hand knowledge of the variety of wild animals which have lived with and influenced man throughout his evolution and spread over the earth. There is an increasing feeling also, that wilderness and wildlife may be strangely important for the preservation and the sanity of man himself

The Urban Environment and Problems.

The growth of cities and the problems of the urban environment perhaps pose the biggest challenge for man in the second half of twentieth century. The rapid growth in industrialization and the sheer mass of people in some of the large cities of the world have not only aggravated old problems of urban life, but have added a new dimension of environmental problems.

In some of the larger cities there are so many cars that they have in fact slowed down movement, swallowed up a fifth of an average city's usable urban land and with the noise of the traffic, made city life unbearable. Old and large cities are plagued by slums, congestion and deplorable shortages of water, electricity, decent housing, schools, hospitals, community facilities and parks. These disadvantages of urbanization have recently manifested themslves in ugly riots and an increase in crime and juvenile delinquency. That all these are symptoms of a social pathology due to the stresses and strains from overcrowding of urban populations, is evident from bahavioural studies of rabbit and other mammalian populations maintained at twice the density compatible with a healthy population.

Pollution of the Environment

Pollution is any substance added to the environment as a result of man's activities and which has a measurable and generally detrimental effect upon the environment. Nature has a vast capacity to recover from minor modifications of her environment. There is, however, a limit to the ablity of nature to recover from continuous abuse. The ever-expanding industrialization, urbanization and increasing demand for growing more food have produced mammoth problems in environmental pollution—pollution of freshwaters, of the seas, of the air, and of the land—with waste effluents and chemicals, sewage, oil, smoke and poisonous gases from motor engines and factories, which directly threaten to exterminate plant and animal life. Besides, pollution by pesticides, fertilizers and radio-active wastes and fall-out from nuclear explosions pose grave danger to the lives of

plants, animals and man, directly through the food cycle. There are already indications that if large-scale pollution of the environment is continued, the erath's life-supporting system may fail, with disastrous consequences for the human species.

One Last Chance

Are we then headed for a catastrophe ? We have one last chance if the power of education and co-ordinated action can overcome the power of ignorance and mass destruction of Nature. The recent 114-nation United Nations Conference on Human Environment held in Stoekholm, Sweden, should mark the beginning of an international revolution in social thinking based on peace and goodwill among peoples and nations, a rational population policy, a ban on weapons of massive destruction, the conservation of natural resources and on methods to reverse pollution of the environment. Unless we systematically find out new and large-scale solutions to resolve the environmental crisis, we are in the gravest danger of destroying ourselves and this planet of ours before the end of this century.

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The First Mile Stone

[Continued from Vol. 15 (1): 92]

By

Nihar

It was a day of acute pain for me, that 16th day of April 1968. I did not have that gangrenous bullet wound in my knee joint; Niharika had it. But every time she made the effort to move I could feel a shooting pain up my right knee and a tremor down my spine. Swallowing the lump in my throat I was calling to her to follow me. "Come", I kept on entreating, "come" Niharika; only a few steps across that creek, and you will rest your sore foot on that soft sand; there, in that bamboo grove. So make an effort to walk."

Standing a bit away in front of her I tempted her with her favourite food, the bananas and sugar cane. She looked as if she understood, for she tried to move towards me. But she failed to muster enough determination. She had been so long anchored to that same spot.....she had to be pushed. Radharani helped her from behind with a gentle push. Niharika moved forward. Slowly at first; then with a rush down the slope into the creek, dragging both her hind legs. Perhaps she could not help it, or, subjectively speaking, did she want to be done with the ordeal soon ! Supported by Lilabati and Radharani (the two tame elephants) she crossed the creek, walked over the soft ground on the far bank and finally stopped at a small stretch of sand in a nearby bamboo grove. Niharika had started on her painful journey to Nandankanan.

We used the trestle bridge and soon caught up with her on the other bank. In her rush down the slope a portion of the sole of her left hind foot got scrapped off on the hard ground. She had limped on her right leg and dragged the left one to partially shift the load from the wounded leg. She was now standing under the shade of the bamboos. There was a trickle of blood on the inner fringe of her left hind foot. There was no remorse, no complaint in her eyes, a distal resignation to the love that urged her to bear silently and live.

A little later Choudhury and Acharya started the routine dressing of her wound and administration of medicines. The details of the treatment were recently sent to me by Acharya, the Zoo Veterinary Surgeon. Briefly, for the record the treatment was:—

First day:—

1. Cleaning with potassium permanganate solution.
2. Dressing with Magsulph.

3. Hot fomentation of the swelling and application of Antiflamin.

4. Intramuscular Dicrysticin - 6 vials: Procaine Penicillin - 4,00,000 units - 5 vials.

Second day to the April 1, 1968:—

1. Cleaning and dressing with Dettol, Magsulph and dressing oil, fomentation and application of Antiflamin.
2. Omnamycin Intra muscular - 8 : 1 - 8 vials and Novalgin 50 ml.

2.4.1968 to 4.4 1968.

1. Copper sulphate gauze (once) and Lorexene dusting powder added to the dressing.
2. Omnamycin i/m twice 8: 1 - 6 vials and 4:1 - 3 vials.

5.4.1968 to 11.4.1968.

Only dressing, fomentation and application of Antiflamin or B.I. Phlogistin were continued. Antibiotics were stopped.

12.4.1968 to 16.4.1968

The usual dressing and fomentation etc. continued. Terramycin liquid pushed into the wound and continuous replenishment by gravity flow main tained through an alkathene pipe inserted into the wound. Intramuscular Combiotic (large dose) - 10,000,000 units of Penicillin together with 10 grams Streptomycin were injected.

Niharika was being given food, Vitamins and mineral supplements of Glucose - 880 grams, Celin, Rovimix and Supermendif. The last two had to be sealed inside bananas or plantain stalks.

Choudhury had devised an alkathene suction pipe with a blower attached to one end. During dressing, the wound cavity was first filled with warm water by the stirrup pump. Choudhury would then insert the open end of the alkathene pipe into the wound and apply suction by working on the blower to drain out the pus and at times, pieces of bone also came out. Two large pieces of bone and a number of smaller bits could thus be extracted during the treatment.

That day the 16th April, when Choudhury, started dressing the wound, in his anxiety to thoroughly clean it he pushed the pipe deep and applied a continuous heavy suction. I was standing close to Niharika feeding har sugarcane when the deep thrust and the heavy suction of the cleaning pipe must have caused her immense pain for she did not make any attempt to take the fifth piece of sugarcane which I offered her. After persistent coaxing she took it reluctantly from my hand, held it in the loop of her trunk for a long time and then dropped it on the ground, her action speaking clearer than any speech, "Sorry, I can eat no more; I am in so much pain today."

As the pain increased, she thrust forward her head and pushed it deep into the bamboo clump at the same time puttimg her trunk towards Choudhury and waving its tip, as if saying, "It is too much for me to bear; a little gently please." I pointed this out to Choudhury who looked up like as from a trance, saw it and said "How stupid of me !"

That day we stayed with Niharika till late in the night. While walking back to the tent Choudhury was discussing with me the design of the footwear he was planning for Niharika's hind feet, a tightly strapped sole-pad of foam-cushioned leather with metal toe-pieces.

Next morning he had made the design on paper and showed it to Narayana Maharana an expert in the job, and told him to have them ready by the 20th April when Niharika was expected to walk the last lap over a bouldery path from our tent to the tractor-trailer.

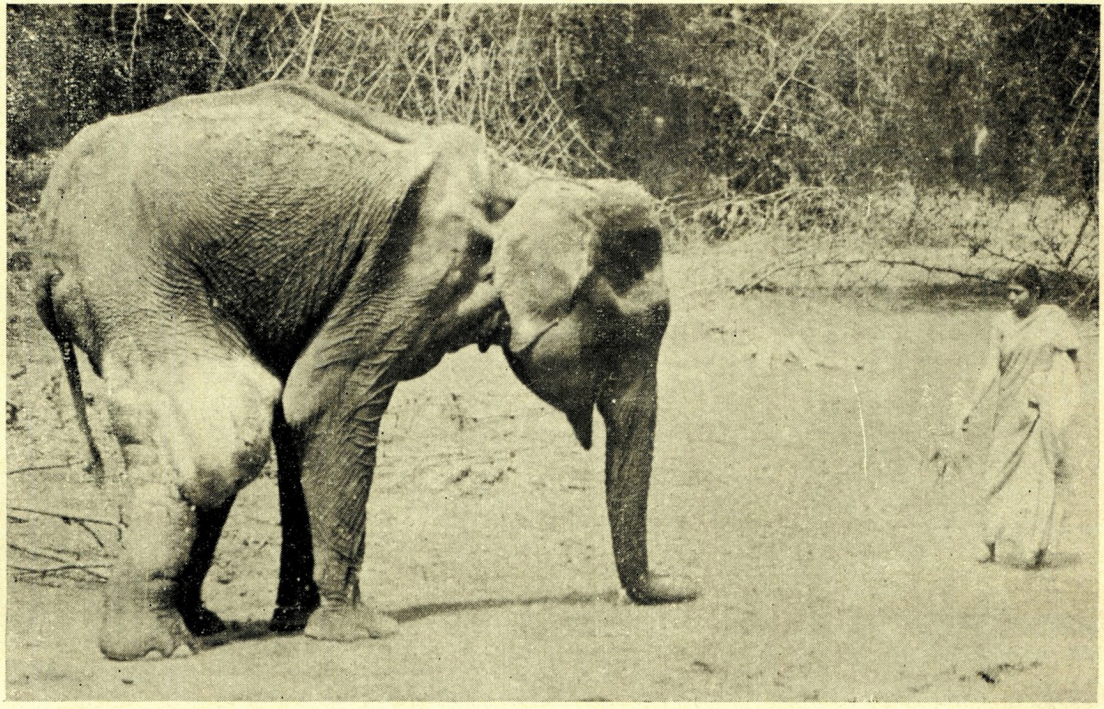
The 17th and 18th April were days of rest for Niharika in the shady grove with a natural floor of thick soft sand. The dressing of her wound was much gentler. The same antibiotics and the usual food, vitamin and mineral supplements were continued. Acharya gave her some diuretic tablets. Niharika looked happy and was in a much more playful mood with me.

On the 18th evening Choudhury piled some sandbags between her front and hind legs, high enough to touch her belly. She was made to kneel and rest on the sandbags. Her left hind foot was lifted. The portion of the hard flap of the sole which had peeled off during her walk on the 16th was cut flush to the skin and removed. The inner layer of the thick fleshy pad was exposed. It was quickly cauterised followed by a thick smear of ointment. Niharika rested an the sandbag padding for quite some time after which she stood up again and did not look uncomfortable on her legs. When we left her at 22.00 hrs. that day she appeared relaxed.

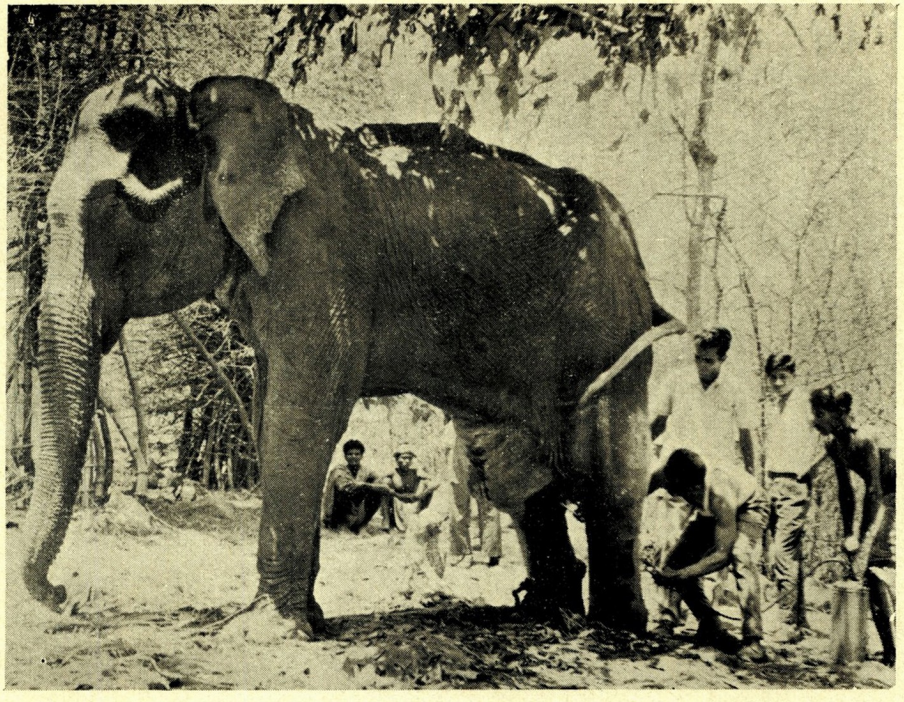
Early next morning, I heard the urgent call of Bhanja near my tent. I virtually jumped out of the bed.

"Ma, we have not slept the whole of last night", he said. "After you left, Niharika was very restless and was trying to make for the forest. At dawn, Paria who offered her food, narrowly escaped from the coil of her trunk which came sweeping over his head. Come quickly Ma. We are unable to control her."

Choudhury had by then come out in his night-wear. He immediately started for Niharika's camp, asking Bhanja and me to follow. As we neared the camp, he stood back to allow me to approach first. My heart was racing. Bhanja's talk had had an unnerving effect on me. Niharika was on the far side of the bamboo clump. I saw her through the clump, standing still, the mahuts and others with sticks in their hands grouped some distance away. The nearer I approached the more unnerved I felt. Then, I remembered the story of the mad tusker and the centre of his love, his mahut's young son..... animals respond to



It was a pitiable crawl



Chaudhury cleaning the wound and Dr. Acharjyo helping villagers in the background

Foetal baby of Niharika—preserved in formalin, September 1972.

Photo by : B. Misra

Eight months after—the cleared bones.

Photo by : Nihar.

love more than human beings, I thought .....for a moment I composed myself behind the bamboo clump. Quickly then, I skirted the clump and called out to her, "Niharika!"

She looked at me with a mixed expression of reproach and guilt.

It was only then that I saw ---- I should have guessed ---- that she had known I was coming; had got my smell from a great distance, and was waiting for me. That was why she had calmed down and was standing still. She had wanted me to come earlier and was sorry for the happenings during my absence.

There was no inhibition now in me. I rushed to her and started patting and caressing her. "You naughty girl; made us feel so anxious," I said.

She looked as if she understood. It was nice to feel that nearness; just as for a dear relative who could not speak and yet responded with clear and unmistakable expressions.

I fed her the whole morning. At the request of the mahuts she was roped by her left hind leg. The rope, however, was untied again in the afternoon because she was feeling uncomfortable.

The treatment of her wound was continued as on the previous day, except for the diuretic.

I had stayed virtually the whole day with Niharika feeding her, talking to her or just sitting near her. We returned to our camp very late in the night.

"There won't be any trouble tonight," I said.

"I guess so," said Choudhury, "we will move her to our camp tomorrow."

Back in the camp he showed the attendants a place near our tent which was to be cleaned and kept ready for Niharika by the next afternoon.

In the morning, the next day, April 20, Niharika walked a little distance towards our camp, following me and followed by Lilabati and Radharani our domestic elephants who would give her support from the side whenever there was need for her to rest. She was using her trunk as the fifth leg. It was no walk. It was a pitiable crawl, every inch of the way. Leaning her weight forward on her trunk and using her forelegs as props she would draw successively her hind legs close to the front feet. She then slowly moved the front legs one after the other to a forward position.....the next.....and the next.....and the next, through an endless drag of minutes and hours. That gruelling journey had a profound effect on those who witnessed it.

Before it got hot I took her to a shady place under a thick bamboo cover close by the water. Choudhury agreed with my decision. "We will make her walk again in the cool of the night," he said.

Her boot for the left hind foot was ready. I showed it to her in the evening and told her that once she was over the soft ground to our camp she would wear boots and feel very

comfortable. I was not consoling her, I was consoling myself, assuaging my own anxiety by holding out a promise.

It had to start, that nerve raking trail of the morning. We made her walk again at 18.00 hrs.; the same sequence, I walking backward towards the camp, Niharika crawling forward towards me, Lilabati and Radharani constantly now on either side of Niharika and giving her support. When she got tired Niharika would lean on one of the elephants at her side, rest awhile and then crawl again.

Evening quietly slipped into the night. Gas lights had been brought. At intervals Niharika was being given a little food and some water. We had lost count of time. She had to cover about three quarter of a kilometre altogether. When she reached the open ground near our camp Choudhury looked at his watch.

"Half past twelve," he said to me, "you must be feeling very tired. Go and have some food and rest. She has to move hardly 100 metres now to reach our camp. Acharya will see to it."

Reluctantly I turned and walked towards the camp. As I passed the bamboo clumps the light from the gas lamps was screened off. There was darkness in the camp. A single kerosine lantern was dimly lit in our tent. The silence of the midnight was punctuated only by the distant call of the long-tailed Nightjar. It makes the silence alive like the firefly that gives life to the darkness, soft, soothing and assuring, to dispel premonition. "But why is it that something wails up within me; an uneasy feeling of something serious impending!" I tried to divert my thoughts to having some food before going to bed.

Choudhury came a little while later and informed me that all was going well. "In another half an hour she will be here." But hardly had he finished saying this when tearing that heavy blanket of the midnight silence there was a long piercing call from Niharika.

"Oh God!" said Choudhury, "she has fallen down."

We ran to where she was lying on her left flank. She had fallen, as Choudhury had suspected. That was the second time in 25 days that she voiced her distress; the first was on the 28th of March when she was roped.

There was dew on the grass. Niharika had slipped on this and had fallen on her left side. With the help of ropes and the two other elephants we tried to put her back on her feet. It did not work. Niharika did not make any effort. She just lay there unable to help herself. Stretched full on her side she appeared to be taking the much needed rest after her continuous standing for nearly a month and that gruesome crawl during the day. When I went near and patted her cheek she looked at me. For a moment there was a flicker in her eye and then it became dull and drowsy again. Niharika was fast drifting into the twilight region of semi-consciousness. She was so very tired! I did not disturb her. Soon she was in deep slumber.

Acharya rushed with the jeep to Bhubaneswar. We had nothing to do but await his return. Some of us tried to have a little sleep or just stretch our bodies on the tarpaulin which was brought from the camp and spread near Niharika.

Time dragged on. It was the only thing that moved. All the rest was stillness. And in that dense silence around, one could hear the snoring of Niharika from a long distance. "Poor thing!", I thought, "How she needed this sleep !!"

The sun was rising when I heard the distance drone of the jeep. Acharya arrived a little later with two bottles of Calborol (Calcium borogluconate) and two of dextrose and normal saline solution. That was all he could manage to get in those early hours of the morning. It was not difficult to find out the veins behind Niharika's earflap and in the emaciated left hind leg. She was still asleep.

When the four bottles had dripped into her veins, Niharika opened her eyes. The warmth of the energy solutions had given her some strength. Life eame back into her eyes. She looked round with interest and when she saw me near her it looked as if she would talk, if she could. All she could do instead, was, pass the tip of her trunk gently over my body. I understood what she meant. She was saying, "I feel so very grateful to you for all that you have done to me. I am so happy to have you near me at this critical moment of my need.' Gently I patted her cheek in assurance to her, and to me.

Choudhury had been engaged in arranging for a small derrick over Niharika. His idea was to lift her body with a pulley-couple and pad the underside with bags of hay. He did it by 9 0' clock. Padded thus comfortably Niharika was resting again.

We put a shade over her using the derrick as support. When the heat of the day increased, hessian soaked in water was spread on her body and she was fanned. A trough of water was placed in front of her. She drew from it with her trunk but unable to put it into her mouth, she blew the water out over her body. I could see her gulping in her dry throat. Surely she was feeling very thirsty. Acharya had been apprehensive that if we gave her any water it may get into her wind pipe. That would mean sudden death. Choudhury was inclined to agree with him. But there she was, trying hard but unable to drink. Should she not be helped I was thinking.

Acharya had in the meantime gone to Bhubaneswar again to consult his Professor in the Veterinary College. He was to bring plenty of dextrose and normal saline solution. They had thought that the normal saline solution if trickled in sufficient quantity into her blood-stream, would quench her thirst and prevent dehydration. I had to wait.

The extreme heat of late April lingered on till the evening. Niharika was evidently feeling more and more thirsty. Acharya had not returned till late dusk. In preparation for the night, gas lights had been brought out. I asked Khamari budha and Guna to get a

few buckets of clean water and some jaggery. I had taken the decision and told Choudhury that happen what may, I was going to help Niharika to drink. "See how thirsty she is, and the way she is repeatedly swallowing her saliva to moisten her dry throat." I pointed to the movements in her throat.

Choudhury did not say anything. He went to the place where the equipment for her treatment had been kept and took out the alkathene pipe. After removing the blower he cleaned the pipe thoroughly, put a funnel into one end and gave it to me. I had by then mixed lumps of jaggery in 4 buckets of water. Keeping the buckets near me I held the funnel a little higher than the head of Niharika. Choudhury slowly inserted the other end of the alkathene pipe between Niharika's tongue and her palate. With a large mug I poured the sweetened water into the funnel. It ran down through the pipe into Niharika's mouth.....a second mug ..... a third mug. In the strong light of the gas lamps I was watching the effect. Niharika was holding the water in her mouth. When I poured the fifth mug she loudly gulped it Not a drop spilled out nor did any get into her wind pipe. "Congratulations and thanks so much for your dominant decision," said Choudhury, standing near me, "she has drunk the water as easily as she would do, standing."

Mug after mug, bucket after bucket hastily mixed --- she took full twelve buckets of that sweetened water !!

Funnel and pipe, mug and buckets, all were set aside. Everybody got near her. All were talking together, each to himself more tham for anybody else to hear. some patted her head. Khamari budha was telling me, "How very thirsty she was Ma?: In my half a century of work in caring for elephants I have never seen one drinking like that. What a 'dharma' (good turn) you have done, Ma ? You knew her dire need ?!"

Niharika was touching everyone within reach for her trunk. She could smell each of them separately to express her gratitude. There was a deep satiated look in her eyes. Putting her trunk lightly on me and looking into my eyes, she almost spoke to me, "How I was craving for that water all through this long oppressive day !! How can I thank pou enough!"

I had no words to express my feelings. I was too full with satisfaction and felt as if I myself had that, much needed, drink. In silence I ran my fingers over her trunk. I knew she understood.

A little while later, I brought 24 bananas. Standing near her mouth I opened her lip and put one in. She took it into her mouth and started munching, slowly, like a child enjoying a chocolate, She was so human in her behaviour, so child-like in her disposition, and, she was so helpless in her present state.

As I write this I can see that tender moment in all its detail as it happened over four years back. Bhanja was holding the gas light high enough to show her face. At long intervals as she finished eating each banana, I gave her another, gently opening her lip and putting it into her mouth as one would to a dear invalid. She was eager to take the bananas. She ate twenty-two. When I gave her the twenty-third, she tried to pull it in with her tongue but could not get a firm grip. In the light that illuminated the opening of her mouth I could see her failing effort to take in the banana and her distress when it slipped out through her left jaw. I gave her the last one; that too slipped out. Niharika was getting tired: she had been eating for about three quarter of an hour; she wanted to eat more of those sweet and fragrant bananas, the most favourite of her delicacies for which she used to be so obstinate with me. My thoughts went back to the day when she first tasted bananas from my hand and the days that followed, her sweet demanding way to get some more bananas from me. But now when I wanted so much to give her more she was unable to take any more... ..Stifling the sob that was rising within me I asked Bhanja to take the lamp away. I wanted to be alone for a while with Niharika.

That was the last she had had of her favourite food from my hand. And, from that day it was the end of the banana for me—my favourite fruit; Choudhury's too. "When I see a banana on my plate it brings back that delicate moment in all its poignant details." He told me once long afterwards, "Remember that last night with Niharika ?" he remarked, without expecting any reply.

Yes, that turned out to be the last night with Niharika, for she died suddenly at 1. p.m. the next day. Till almost the last hour on that last day she had had her wound dressed and her routine injection. Every one had nourished the fond hope that she would stand up again, and make her journey to Nandankanan.

Acharya, after his return from Bhubaneswar in the night had given her an intravenous injection of 2 bottles of Calborol, eight bottles of Dextrose, and some brandy, orally, a few times.

By noon the next day she had been injected with a further eleven bottles of dextrose and normal saline solution and some Coramine. She was being fortified so that she could be lifted to the standing position. This was being organised by Choudhury.

News about Niharika's accidental fall had reached the villages. Many people had come to see her and render whatever help they could. With the help of the villagers Choudhury erected a bigger derrick after removing the smaller one. By running padded ropes round her body, axilla and iguinal regions he tied them over her back to make a comfortable sling. He then climbed to the top of the derrick and tied the pulley-couple firmly. The sling was to be fastened to the hook of the pulley-couple.

While he was still up there, I came to see Niharika. She was in the open sun. As soon as everything was fixed, all were to go to the camp, quickly have some food and come back to help in lifting Niharika. Lilabati was to help the people in drawing the pulley-couple up and Radharani would give support to Niharika.

With rising confidence and full of hope all of us were in high spirit. I gave some sweetened water to Niharika in a pipe, which she took gratefully. You will be up again soon, little girl and be with us in the camp to night," I spoke into her ear.

I could not linger any more near Niharika----I wish I had; I would have been with her when she breathed her last----Choudhury was calling me to hurry for lunch.

In our tent, before we had even sat down for some food, Bhanja came running and told us that something looked very wrong with Niharika. In great anxiety we ran to her. Everybody was anxiously crowding around her.

When we came to where she lay unresponding, Choudhury opened her eye-lids wide saw the vitreous look in the dilated pupil, and then looked at Acharya who agreed with a slight nod. In grim punctuation of each word exposing his uncompromising mood with fate, he said "Niharika is dead."

Not one of them was prepared to accept that painful truth. They all placed their hands on her body, her cheek, her trunk. How warn was her body, how supple her trunk and that soft moist lip at the end of her trunk with which she had made all her demands and given all her love. It was not as if we had known her for only twentysix days; to us she was like a very dear one whom we had known all our lives.

Khamari budha was crying shamelessly; many were wiping their eyes. She should not have left you Ma. But who could help this; it was God's will Ma," he was trying to console me for he saw how I was feeling. It was too much. I had to find a place all to myself.

At 10 P.M. Choudhury and Acharya brought him in a tray. He was the tiny baby who had died in the womb with his mother. He was a miniature elephant in all its details with a glossly hairless body, cute little trunk, a small 127 mm (5″) tail and those dainty ivory-like nails, five in each fore foot and four in the back ones. He looked very much like those miniature rose-wood elephants. With a shoulder height of 228 mm (9″) and a total length of 685 mm (27″), tip to tip, he weighed just 2.5 kilograms. He would have spent another 12 to 14 months in the womb and grown nearly 4 times in height beford coming out, to follow at the heel of his mother with all the unending demands for her love. Had she lived; had he been born alive; Niharika would have made me his Aunty. He would have grown up into a big tusker like his father who had come to bid good-bye to Niharika.

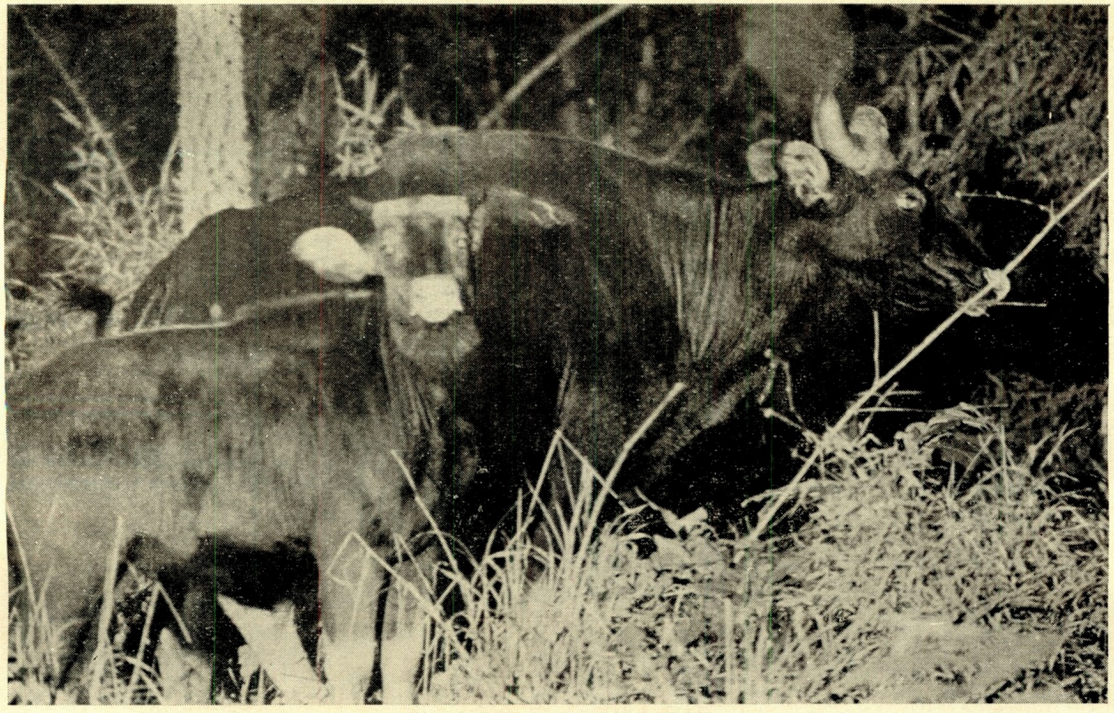
Niharika and the author – March 28, 1968

Her daily bath was ritual

Photo by : *Nihar*

The well wisher, Black Partridge.

Photo by : S.R. Choudhary



Gaur

Photo by : S.P. Shahi

Brought up with love and understanding he would have been sweet tempered like his mother and the pride of Nandankanan.

"Niharika should have lived at least for this baby." Acharya gave vent to his disppointment.

"Don't let your emotions get the better of your judgement, Acharya: you saw the inside of that gangerenouz wound" said Choudhury.

For the autopsy, the derrick was used to lift her right hind leg. The leg had been incised along the bullet-route in the joint. It had revealed that the bullet had travelled through the middle of the knee (stifle) joint smashing the ends of both the long bones of the leg (femur and tibia), and lodged behind the knee-cap (patella) to start the sepsis. Although the bullet had been later pushed out by the pressure of the accumulating pus, the dead bones in the joint had continued to behave like foreign bodies to increase the sepsis. Buckets of pus with pieces of bone had poured out from the frontal abscess of the leg. General septisemia had spread practically to every internal organ with the uterus the worst affected.

"What a harrowing time she must have had in that condition ? Can you think of an elephant with an amputated hind leg ? Should she have lived to provide that chance for a trial ?" Choudhury asked into the emptiness of the night.

Floating over the silent ripples of the lake came the reply in soft whispers from the Barapitha forests, "In life, she showed the depth of love and feeling a mute animal is capable of responding to. In death she revealed the exent of inhuman cruelty a human being is capable of inflicting ! It was good that she died."

* * * *

Three days after, I was busy in urging the acceptance of my resignation from service as the State Organising Commissioner (Guides), Bhart Scouts and Guides and also from State service in Orissa. The forests and its mute denizens had got a complete grip of me.

———

A Note on the Eravikulam-Rajamallay Sanctuary High Range, Kerala.

Description

The Eravikulam-Rajamallay area forms the highest upland of the Kerala High Range. The elevation varies from 6500 ft. above M.S.L. to 8841 ft. which is the top of the Anaimudi peak, the highest point south of the Himalayan range. The Eravikulam area is approximately 21,500 acres in extent, connected by a narrow ridge with the Anaimudi peak and the Rajamallay sanctuary which is a further 2500 acres in extent. The total area of both the regions is, therefore, approximately 24,000 acres (Approx. 35 sq. miles).

The Plateau is very similar to the Nilgiri downs, the difference being that unlike the Nilgiris the ecology of this region has not been disturbed by man. There are no wattle or Eucalyptus plantations, no cultivation or grazing. There are no motorable roads except the one which skirts the southern portion of the Rajamallay sanctuary. There are two tourist huts at Poovar and at Eravikulam, there being a small artificial dam at the latter place. The topography is the typical downs and shola form-action of the Nilgiris. Red Rhododendron is common, there being no Lantana nor Eupatorium which is a plague in most forests in that part of the country, bearing ample testimony to the over-grazing these forests have suffered. In the Eravikulam Rajamallay area there has never been any grazing nor is any grass cut for fodder as the verdure is not consumed by cattle. There is no human habitation in the sanctuary area nor any cultivation in the past even by the Muduvan Hill Tribe. The annual rainfall during the south-west monsoon reaches 300" on the south western side, water logging the flat lands in the Nalas. The eastern side is in the rain shadow and receives lesser rainfall. Along the outer perimeter of the region are high steep cliffs and there is very little top soil on the hill tops. During the monsoon, mists are perpetual and gales a common feature. During the winter months the nights can be bitterly cold. There are five perennial streams in the Eravikulam area.

Past History

The Eravikulam Rajamallay area formed a part of the concessions given to the Kanan Devan Hills Produce Co. Ltd. For this the company was paying an annual land tax of Rs. 41,000/- per year to the Kerala Government. Both the areas were not used for any commercial purposes. They had both been declared sanctuaries by the Company and were under the overall control of the High Range Game Preservation Association with the financial support of the K.D.H.P. Co. Ltd. It was utilised by the Association, comprising mostly of the officers of the Kanan Devan Hills Produce Co., for purposes of sport, both fishing and

hunting. It must be pointed out here that the hunting was strictly regulated and the average number of Tahr Shot were a little more than one per year. These were mostly "Saddle-backs" which are males past their prime and their cropping posed no danger to the welfare of the herd. On the other hand the presence of the occasional sportsman is a beneficial factor in preventing poaching. In the past 25 years only 5 tigers have been shot in the region. A certain number of Gaur bulls and Sambar stags were cropped from time to time and Wild dogs destroyed when possible. Rainbow trout fishing had been a regular feature and is useful as it controls the excessive population which has already out-stripped the food supply. Since there are no motorable roads in the region the visitors and the sportsmen had to walk over most of the area while the lack of any disturbance by motor transport safeguarded the grandeur and the unsullied topography of this region. The Muduvan Hill Tribe which are the original inhabitants of this tract have always provided the guards employed by the Kanan Devan Hills Produce Company to protect the area from poaching and they have done a very effective job. They are knowledgeable and dedicated.

Present Status

With the passage of the Kanan Devan Hills (Resumption of Lands) Bill, 1971, by the Kerala Legislature, followed by the Supreme Court ruling in April, 1972, up-holding this legislation, the Eravikulam Rajamallay area together with other uncultivated areas under the control of the Kanan Devan Hills Produce Company have vested with the Government of Kerala. The area has not yet been declared a "reserved forest" under the Indian Forest Act nor does the Kanan Devan Hills Produce Company (or the High Range Game Preservation Association) have any authority over this region. Legally speaking, therefore, the Muduvan Watchers would today have no legal sanction to apprehend anyone, either trespassing or poaching in these areas. This tenuous position is, to be say the least, fraught with great danger. The area should forthwith be brought within the purview of the Indian Forest Act, by the month of August at the latest so that it could be effectively protected before the rains end and make the place open to access.

Fauna:

The elephants are seasonal visitors. There is a substantial Gaur population. Sambar are plentiful and Barking deer scattered all over. There are approximately 5 tigers in the area. Panthers are fairly frequent and I came across their foot-prints and droppings on more than one occasion. Black panther are known to exist. Civets, Jungle cats, Nilgiri langur and Wild boar are common. The two very seriously threatened mammals of South India, the Lion-tailed Macacaque and the Malabar Squirrel occur in the area though in small numbers. Wild dogs had greatly increased in number and had caused considerable damage to the sambar population. The most important mammal, however, is the Nilgiri tahr (*Hamitragus hylocrius* Ogilby). In a census carried out by George N. Schaller in 1969, a figure of approximately 500 tahr was reported and the population was described as healthy

and on the increase. Schaller and Daniel have also made a survey of the Nilgiri tahr population in the other areas of its occurrence and are of the view that the herd in the Rajamallay Eravikulam area comprises more than half of the total world population of this very localised, unique and seriously threatened mammal.

When I visited the area inclement weather made it impossible to carry out the survey of the present population. However the evidence of tahr was everywhere on suitable grounds, and Mr. Gouldsbury the most knowledgeable member of the Game Preservation Association, informed me that the population has subsequently increased after two successive good crops of kids. He estimated the present population at 600 tahr. The Association have provided artificial salt-licks which have been taken great advantage of by the ungulates, especially the tahr. In Rajamallay sanctuary the herd of tahr, close to the road leading to the Rajamallay Tea Estate has become so accustomed to humans that they would come to the salt-lick right upon the road in full view of visitors. However, when the control of the area passed out of the hands of the Kanan Devan Hills Produce Company, some unfortunate poaching instances took place at the spot. The Kanan Devan Hills Produce Company authority had to stop providing salt and have driven away the herd from this area to prevent it from being slaughtered.

As for the birds, Imperial pigeon, Green pigeon, Grey Jungle fowl and the Palni Hills Laughing-Thrush, occur in this area. The introduced rain-bow trout have multiplied spectacularly. However, due to the shortage of food supply in the small streams they rarely exceed 1 lb. in weight.

Factors of disturbance

Though there were only 4 Muduvan tribals employed as Game Watchers plus the 2 Gatekeepers on the Rajamallay Road, the area has been very effectively protected as proved by the very substantial population of wild life in the area. There was practically no poaching from the western side as the area is mostly high precipitous cliffs and there is the Malayattoor Reserved Forests below these cliffs. From the southern side the area has so far been effectively protected by a cordon of Tea Estates where the labour are the employees of Kanan Devan Hills Produce Company. On the northern side, is the Anamallai Reserved Forests of Tamil Nadu. Some poaching is reported to have occurred from this side from the Government Cinchona Plantations in the Anamallais. However, the main poaching threat comes from the Marayoor village on the eastern side and consequently there are very few tahr and Gaur here.

Being a very wet region with no human habitation, there are no accidental fires. However, the Company has been carrying out controlled burning in the months of December and January. The areas are burnt in alternate years and in patches, so that the whole tract

is not burnt out at a stretch. The plots which are burnt are selected so that they have streams as boundaries. Since the burning is done after the winter rains and just prior to the dry spell, fresh green shoots come up which are a source of great attraction to the ungulates, particularly the Tahr. As the areas are burnt alternatively the grass-land ecology is not altered, and as the burning is done soon after the winter rains the fires are also not intense. The ash of the burnt grass provides phosphates and is consumed by the ungulates.

As mentioned before, there are no motorable roads, and only one track which could be used by a motor-cycle in fair weather, leads to the Eravikulam huts. The entire area, therefore, is completely undisturbed. There are no plantations, nor any forest produce extraction, grazing, grass cutting or cultivation even by the Muduvan Hill tribes and there are, so far, no irrigation or hydel projects in this tract. The area retains its pristine glory due to the lack of any human disturbance. If, God forbid, a mistake is committed in building a road or in of locating a hydel site there in the future, this area will be altered and lost beyond redemption.

Importance of the area

Summing up, the Eravikulam Rajamallay area is the only viable unit of the shola-grass down ecology which survives today in its pristine undisturbed state. While aesthetically it is one of the most beautiful spots in the country, its value as an area for research is inestimable. It contains the highest peak in India south of the Himalayas. Though unfit for man or cattle it is a prime area for wild life, harbouring as it does some of the India's most threatened animals—the tiger, the Malabar squirrel, and what is most important, the Nilgiri tahr, an animal found only in the southern parts of the Western Ghats. Perhaps the entire free living the world population of this animal is in this tract. It is one of the finest wilderness areas in the country and can be utilised for purposes of trekking, hiking and camping, including a visit to the top of the Anaimudi peak.

A hike in this region does not entail the physical discomfort often necessarily associated with a Himalayan trip. A walk over the downs is a most pleasant and invigorating experience as it does not involve any serious climbing, and if a visitor wishes to avoid even this, the area could easily be traversed on pony back. A certain number of Saddlebacks could well be harvested each year, and there are tremendous fishing potentialities.

Recommendations

These are briefly as follows:

(1) The 24000 acres of the Eravikulam Rajamallay area should forthwith be declared a "reserved forest" under Section 4 of the Indian Forest Act. The present Muduvan Watchers should be declared as Game Guards under the Forest Act so that they have the legal status to seize and apprehend poachers. The area could then subsequently be declared a National Park and a Wilderness area. The name Anaimudi National Park is recommended.

(2) The present staff of Muduvans be augmented. There should be 5 Muduvan Wildlife Watchers posted at Poovar during the period October to May as it is from this region that poaching is most prevalent. Two Guards be posted at Eravikulam and three Guards at Rajamallay plus the two Gatekeepers on the Rajamallay road. In short, only 6 more people need be appointed besides the 6 already employed by the Kanan Devan Hill Produce Company. Either all the 12 should be brought on the staff of the Government or they could be kept under the control of the High Range Game Preservation Association, and a requisite grant be made to that Association to maintain the same. A parallel example exists in the case of the Nilgiri Game Association which is subsidised by the Tamil Nadu Government, and the Peermade Game Association which is subsidised by the Kerala Government. In a statement which is furnished by the Chairman of the High Range Preservation Association, the total cost of the staff, maintenance of the huts and paths, rock-salt licks etc. does not exceed Rs. 20,000/-. Even with augmented staff, the total cost in my opinion would not exceed Rs. 40,000/-per annum. Staff should be given special pay and uniforms, and should be armed with service rifles like .303 which will render their patrolling more effective and instill confidence in the watchers. A total of five service weapons should be sufficient.

(3) Huts for the staff may be set up at Poovar and elsewhere. The total cost on this would not exceed Rs. 25,000/-.

(4) Rock-salt may be provided at 5 different places in the area. Once the area is rendered safe, rock-salt may be provided once again on the Rajamallay road as this is perhaps the only place in the world where the tourist can drive up in a car to see the Nilgiri tahr at close quarters.

(5) There should be no dam or hydel Project nor any other motor road leading into the area.

(6) No exotics flora or fauna should be introduced into the area and no human habitation or exploitation of any kind, with the exception of trout fishing and perhaps the cropping of two saddlebacks a year under strict supervision.

(7) The present system of controlled burning may continue.

(8) Research should be carried out in the region and this should be a continuous process. Amongst the items recommended for research are classification of the flora, the grasses in particular (preparation of a range inventory)—; ecology of the tahr; the grassland-shola ecology; effect of Wild dog predation and whether the control of Wild dog population is necessary or not; the effect of fire on the grasses; and the optimum carrying capacity of the habitat in relation to the various species.

(9) Annual enumeration of the larger mammals of the area should be carried out, especially of the tahr and the tiger.

(10) The High Range Game Preservation Association may be given the privilege of controlling the fishing. This is being done by other Game Associations such as Peermade Game Association in the Periyar Sanctuary. Representatives of the Association can be declared as Honorary Game Wardens with the right to patrol the area.

(11) The total number of Nilgiri tahr in captivity in this country is less than 10. It is necessary that the captive breeding programme of this animal be carried out in semi-captive conditions, perhaps at one end of the Rajamallay sanctuary. There are reported to be some 50 tahr scattered in three isolated localities in the K.D.H.P. area outside the Eravikulam Rajamallay area. These areas are Tertians Plateau, Karumkolam and Periavurrai. The tahr in these three isolated pockets are certainly doomed. An attempt should be made to capture some of them and to breed them in semi-captive conditions.

(12) Though the area cannot attract tourists as can Periyar or some other National Parks, access in the motor cars not being possible into the region—it still has great potentialities for the fisherman, the trekker and the rider. Ponies can be kept by the Game Association and can be given out on hire to visitors. Similarly, certified guides could also be made available by the Association, as well as porters. Binoculars and fishing tackle could also be made available on hire.

(13) The rest house at Eravikulam needs to be improved and provided with better amenities. Later on a larger and better rest house could also be made there when the tourist traffic increases.

(14) The area being in private hands so far, it has not received the public attention that it deserves. Now that it is vested with the Government, adequate publicity needs to be given. A colour film should be made of the area and its wild life,. and a brochure should also be prepared as a tourist guide.

———

An Encounter with a Rogue Elephant

By

Nihar

My interest in elephants was increasing day by day. In the Chila-Khara forests, 6 kms. from Hardwar across the Ganges, in Landsdowne Division, I was always keener on elephants and tigers.

In early May, 1971, we were camping in the Chila forests with the second batch of forest officer trainees undergoing the Wild Life Management Course. I usually do the tracking in such camps; honorary of course. I had been looking, this time, for the twosome tuskers of Chandi Range and the genial Mundhal Makhna (tuskless male). We had not found them yet. On the 5th May, we were out in the field at 5 A.M. At 5.45 A.M. we found a tusker crossing the Chila-Khara road from the Ghasiram Sot (dry stream) side. He was a little over 9' in height with nearly 3½' long symmetrical tusks of 12" to 14" girth. The top-lap fold of his ear, was about 2" and the age therefore, around 45 years. He was in good health. Choudhary, the officer-in-charge of the course and two officer trainees, Jaisingh and Quereshi, and I tracked him. Choudhury, Jaisingh and Quereshi together took turns in making notes of his behaviour. These records make interesting reading. I quote extracts from them.

Chaudhury's notes

072000.....still feeding, same spot.

072700.....Branch (*Mallotus*) broken with loud cracking noise.....
we are 50 metres from him.....
down wind with front lighting—not aware of us yet.

073300.....Broke twig (*mallotus*) cleaned leaves and fed on twig.

073400..... -do-

073500..... -do-

(forest—sal patch quality III/IV, grass, *Clerodendron, Colebrookia*, elephant pollarded (*Mallotus*).

073800..... . Broke twig (M) feeding--incessant ear-flapping and tail-swinging.
(M) = *Mallotus philippensis*

* * * *

080200.....Turned South-east—starts feeding (M) again.

080300.....Broke twig (M) feeding.
(M) = *Mallotus* philippensis.

* * * *

080330.....Got disturbed—tried to wind us—we are still down wind—moved toward us to see—I also moved—he got scared—turned and moved away 6 paces—west.
080600 .....Started feeding again.

* * * *

082300 ..... Dust bath.
082500 ..... -do-
082600..... -do- Trying to wind us—we are still down wind.
082800 ..... Half-hearted attempt to feed.
082900.....Dust bath.
082930..... Trunk on left tusk—trying to wind us—facing east.
083039 .....Half-hearted attempt to feed—got suspicious—came straight to us within 20 metres—stood his ground looking at us—we slowly moved back.
083500.....Dust bath.
083600.....Trying to wind us again.
083700.....Dust bath—east, chital bugled 3 times—N.E. Chital bugled 4 times also.

* * * *

Qureshi—Jai Singh's notes:—

102500..... Turned North, moved a little.
102600.....Dust bath ventral, broke twig (M), feeding.
102700.....Moved 10′ NW. Returned N and then walked away NW.

* * * *

Choudhnry's note:—

110300..... .....Located him standing silent under a small tree. Waited for him to move to the open—would not for a long time. Then at long last be went under a small tree-shrub combine—resting—putting his forehead on the trunk of the tree, his tusks on the branches, he curled up the trunk, lifting forward the tip to get our smell. I wanted to get nearer than 10 metres from him. He got irritated, came out into the open, faced us, lifted his head, curled his trunk in, his ears flat backwards, and, the next moment, he charged..... After chasing us for 50 metres he stood under a *Terminalia belerica* tree. Having shooed us away he leisurely strolled back to the same place for his midday siesta. Followed him back. Watched for some time. He was unconcerned. Left him alone. Walked back to camp some time after midday.

* * * *

In the afternoon, the same day the D.F.O., Lansdowne Division came and told Choudhury that while he was out in the Kunau forest, three days earlier, on the departmental elephant, the Kunau rogue chased them. The D.F.O. took a pot-shot at him. The bullet appeared to hit the head. The rogue turned and ran away. The D.F.O. requested Choudhury to try to shoot it.

We had heard about this rogue for quite some time but had not crossed its path during our previous three visits in two years, to Kunau.

Two days later, the D.F.O. sent a special messanger with a permit for Choudhury to shoot the rogue. We decided to go after him the next day when the trainees would be doing mapwork in the camp.

I got up at 4 a.m., prepared breakfast and also the lunch. There was some fried green pigeon from the previous evening, which I kept for the lunch. By 5.30 a.m. we started with packed breakfast, water bottle and all necessary equipment for a long day. Choudhury took his .375 magnum rifle loading it with three Weatherby Cartridges, his usual shikar superstition for luck. We also took the Camera.

In the car, on our way to Kunau, I thought that if, both of us die, nobody will know. What will happen to my fried green pigeon ! I prayed to God to help us, At about 6.30 a.m. we reached Kunau. The Forest Guard was not there. We enquired about the rogue from the coupe marking people. The marker said "Babuji, nobody has entered the forest since the D.F.O. shot at the rogue.....We don't know where it is now. He is the only tusker in that forest." He pointed towards the hills where the D.F.O. had shot at the tusker. No one came with us to show the spot. We took the car a kilometre inside the forest, and parked it there.

This adventure was quite new to me. I had accompanied Choudhury after a man-eater (tiger) in Dec. '67-Jan. '68. But this was quite different. I was told earlier that the rogue had killed some people and one would not know from which side and how he would appear ! Those words were ringing in my ears, and made me nervous. On the way we had heard two Black partridges calling at two different places, "*Subhan tere Qudrat*" (Glory be to God). To me, at that moment, it echoed as, "wish you a good luck." I persuaded myself to believe and derive courage from it.

We started tracking on foot at 6.30 a.m., Choudhury leading with his rifle ready and the camera slung from his left shoulder. I followed him, loaded with haversack and the water bottle. With two fistfuls of dust I kept checking the wind direction, every hundred steps.

We were walking thus, slowly, when all of a sudden there was a rustling sound in the silent forest. I felt a thud in my heart which almost choked me. But the next moment a barking deer appeared and ran across the path. I heaved a sigh of relief.

We saw fresh elephant foot-prints all over. We followed them for 400 steps to the right but soon returned to the path. We saw some marks on the left too, leading into a hill but we took an old extraction path skirting the hill and reached a dry nala by 7.30 a.m. There was a big flat rock by the road side. The surround was quite open. We stopped there, looked around carefully, and, sat down on the rock. I was feeling hungry and thought,

"Better to finish our breakfast at least, before we die." As if sensing my thought Choudhury said, "Let us have breakfast."

We started on our breakfast keeping an anxious eye all round us. A short time later, we heard a tiger roar, twice, on the western side, followed by the rumbling of an elephant a little further, in the same direction. In great haste we finished our breakfast and started in the direction of the noise.

After leaving the path we went in the direction from which the rumbling noise of the elephant had come, taking a circuitous route through the forest to remain down wind of him. The forest was thick with tall *Adhatoda* bushes more than a foot above our heads. They were so thickly interlaced that it would have been impossible for anyone to run if charged by an elephant. In that thicket one could see only a few feet around. There were scattered groups of trees which would not have provided any protection from an elephant. I had no weapon. I held a stick and kept 5 paces behind Choudhury. He was stalking in a half crouch with his eyes fixed ahead and his rifle ready for use.

As we entered deep into the forest, I felt as if my legs would collapse. Praying to God and depending on Choudhury and the well-wishing Black partridge, I entered that dense shrubbery. While moving very silently, I kept watch on both sides. A little later I heard a soft sound of some animal approaching us. With my attention in that direction I followed Choudhury. The sound came nearer and nearer—moving on dry leaves. On hearing the sound I had whistled to draw the attention of Choudhury but he did not wait; he was rather annoyed, thinking that I was wasting time without following him.

The low sound on the dry leaves came very near, and soon, I saw a paw .....I stopped there to watch, and the next moment I saw the head—two eyes staring at me from behind the bush... It was a tiger ! When I saw the tiger, automatically without thinking, I lifted the stick and said, 'Hass'. In a flash the tiger turned and ran away followed by a grown up cub which I had not seen till then. It was this tigress with cub, that had roared earlier. Choudhury did not believe that I had seen the tigress. He kept on asking me in a whisper, in apparent irritation, to follow him.

About a hundred and fifty metres ahead we saw the rogue feeding. Choudhury tallied its description with that given in the D.F.O.'s permit. I wanted to go a little forward to get a better view and, perhaps also get a picture of him. But Choudhury signalled me to stay where I was. As the tusker lifted his trunk to get a branch, he aimed and fired, and with a ku—r—r—ru—o—o—u sound the rogue fell sideway to his right. Choudhury ran forward immediately and gave the routine second shot, which bumped the head one foot off the ground. The first shot had gone through the ear hole. The seond was 4" in front of it, between the ear and the eye. The Kunau rogue lay dead at our feet. Choudhury looked ati t and said, "What a tame and ignoble death for him ?!"

It was 8.30 a.m. On our way back I marked the path by putting the tracking sign up to the spot. While returning I showed Choudhury the pugmarks of the tigress. It was only then that he believed me and said, "Had you not seen her earlier it might have turned out to be another Karlangi accident. Remember the death of Kani and the Belgarh tiger returning for the last bit of liquified (maggotted) brain in the skull that night, on May 2, 1968 ?" ..... He looked at me and said, "Thank God, you saw the tigress in time. But you know, it was wrong to wave a stick at the tigress and shoo her the way you did. Lucky again that she was inside the cover." We informed the villagers and drove back to camp.

On our way we saw one of our well-wishers, the Black partridge, in the middle of the road, waiting to congratulate us. We stopped the car to thank it, and, wanted to take a photograph of it. It leisurely walked into the natural setting to pose for the picture.

The trainees were eagerly awaiting our return. The first question they asked Choudhury was, whether or not he had killed the rogue. "Yes", he replied. And, there was a big 'hurrah'. Everybody wanted to see the dead rogue. A truck was available. Soon all of us were back at the carcass. The trainees helped in getting the tusks out. The villagers were there too, checking up and confirming that it was the rogue. Fateh Singh, Wildlife Warden from Rajasthan (one of the trainees) first detected the bullet wound high above the left eye. A wide patch there was soft and palpable. The point of entrance of the bullet was located. It was the wound made by the D.F.O.'s rifle.

A little while late came Karamchandani, the Dean of the Forest College and Oswald, Lecturer at the same College and Hony. Editor of 'CHEETAL' who had reached the camp after we had left it, heard about the rogue, and drove on straight to see it. Oswald first saw the maggots dropping from the hole made by the removal of the left tusk. It was from the previous bullet wound.

* * * *

Back in the camp, Choudhury wrote a brief demi-official letter to the D.F.O. Lansdowne. He ended by stating, "70 years old Ganga Singh came to thank me with tears of gratitude moistening his failing eyes (his wife had been killed by the rogue). That was more than adequate reward for Nihar's and my labour. The tusker did not have a chance to fight. The tusks are of no worth to me. I am sending them herewith for whatever you may feel fit to do with them. I do not keep such sad momentoes. Personally, I would appreciate it if the tusks are sold and the money distributed to the people who have been directly affected by the rogue."

Five days later we went to see the carcass. The stench polluted the atmosphere for miles around. We took a polythene sheet with which we covered the carcass, placed billets and boulders all around its frill, on the ground and on the top of it, we spread cut branches

to camouflage the carcass. The hordes of waiting vultures on the nearby trees slowly departed to look elsewhere for their food. In any case, even after four days they had been unable to break through the thick skin of the elephant which was fast drying up.

This proved an effective way to prevent the srench from polluting the area.

Eight months later we returned to the same spot. The insects and microbes had done a thorough job of the carcass. Bones had been cleaned and scattered; easy to collect for the bonemill. The polythene sheet had been torn and the skull rolled 30 feet away, presumably by elephant. Later, enquiring at the village we learnt that no one had gone to see the spot after we had left it on May 13. But, from that day, there was no further smell from the area.

The polythene had served its purpose well. On February 8, 1971, the U.P. Chief Conservator of Forests, has posed the problem of disposal of carcasses of culled elephants to Choudhury. The Kunau rogue provided the solution.

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Some Bird Notes in Kutch

By

R.S. Dharmakumarsinhji

Kutch in the north-west of Gujarat State receives a large number of migratory birds and is less inhabited than other parts of the State. The coastal area is particularly interesting for shore birds, still not completely surveyed.

I made a rapid survey of some parts of the coast which lies between 23° N. and 68°E. and 24°N. and 70°E. during the week of 26th June to lst July, 1968.

Interesting birds noted between Jakhau and Lakhpat on the coast are as follows:

Great Crested Grebe (*Podiceps cristatus*). Breeding plumage.
Cormorant. (*Phalacrocorax carbo*)
Indian Shag (*Phalacrocorax fuscicollis*) Breeding plumage.
Pygmy Cormorant. (*Phalacrocorax niger*)
Grey Heron (*Ardea cinerea*)
Little Green Heron (*Butorides striatus*) Breeding.
Indian Reef Heron (*Egretta gularis*)
Osprey (*Pandion haliaetus*) Possibly nesting.
Great Indian Bustard (*Choriotis nigriceps*)
Oyster Catcher (*Haematopus ostralegus*) Very shy.
Kentish Plover (*Charadrius alexandrinus*) Possibly breeding.
Grey Plover (*Pluvialis squatarola*) Full plumage.
Whimbrel (*Numenius phaeopus*)
Curlew (*Numenius arquata*)
Blacktailed Godwit (*Limosa limosa*)
Bartailed Godwit (*Limosa lapponica*)
Redshank (*Tringa totanus*) full plumage.
Greenshank (*Tringa nebularia*) Full plumage.
Common Sandpiper (*Tringa hypoleucos*)
Snipebilled Godwit or Asian Dowitchet (*Limnodromus semipalmatus*) Possibly new record.
Curlew Sandpiper (*Calidris testaceus*)
Avocet (*Recurvirostra avosetta*)
Crab Plover (*Dromas ardeola*) Presumably breeding.
Pratincole (*Glareola pratincola*)
Slenderbilled Gull (*Larus genei*)
Caspian Tern (*Hydroprogne caspia*) Parents feeding young fully fledged.
Whitecheeked Tern (*Sterna repressa*) possibly new record.

Little Tern (*Sterna albifrons saundersi*) Eggs appeared of this race.
Large Crested Tera (*Sterna bergii*)
Lesser Crested Tern (*Sterna bengalensis*)
This is not an exhaustive list and many birds seen mostly common are not listed.

I am grateful to Officials of the Gujarat State Transport, Divisional Forest Officer, Bhuj, Range Forest Officer, Nakhtrana, Reserve and State Police Forces and M.K.S. Fatehsinhji for the help given to me in this trip. And for the hospitality shown to me by the Jakhau Salt Works.

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Observations on Weight and Size at Birth of Some Wild Mammals in Captivity

By

L.N. Acharjyo[1] and R. Misra[2]

In the changing conditions of the world which endanger wildlife, Zoological Parks play an important role in the preservation of vanishing species of wildlife, by breeding them in captivity. It is essential to have a sound knowledge of all aspects of reproduction including the weight and size at birth of wild animals for their successful breeding in captivity. Many of the records on the weight and size at birth of different wild animals are based on captive specimens only. The largest of the living land mammals, the elephant, produces young weighing 175 to 213½ pounds and height from 2 feet 6 inches to 3 feet, at birth (Crandall, 1965), probably the maximum weight and size at birth among land mammals. Similarly the weight of a male Indian rhinoceros calf at birth was given by Lang (1957) as 60 5 Kilograms and that of hippopotamus calves given by Verheyen (1954) as varying from 34 to 40 Kilograms. Acharjyo (1970) reported on weight and size at birth of nine common wild mammals maintained at Nandankanan Biological Park, Orissa as observed by him during the period from 29.12. 1960 to 30.6. 1969. Reports on the weight and size of different wild mammals at birth specially from India are scanty. The present paper is an attempt to place on record further observations on the weight and size at birth of twelve kinds of wild mammals of Nandankanan Biological Park, Orissa; observed during the period from 1.7.1969 to 30.6.1972. The weights and measurements were taken either immediately after or within 12 hours of birth.

Observations and Discussion

1. Tiger (*Panthera tigris*)

The weight at birth of seven cubs, born during the period mentioned above was from 0.920 kg. to 1.450 kg. with an average of 1.202 kg., the length from tip to tip was from 49 cm. to 58 cm. with an average of 53.4 cm. and the length of the tail was from 14 cm. to 17 cm. with an average of 15.6 cm.

At birth, the length[3] from the tip of the nose to the tip of the tail of three tiger cubs born at New York Zoological Park was 20 inches and their weights were 2 pounds 8 ounces (male); 2 pounds 9 ounees (male) and 2 pounds 11 ounces (female) (Crandall, *loc. cit.*). Tiger cubs at birth weight under three pounds (Denis, 1964). One male tiger cub weighed

1. Veterinary Assistant Surgeon, Nandankanan Biological Park, P.O. Barang, District Cuttack.
2. Wild Life Conservation Officer, Orissa, Cuttack-1.
3. All length measurements are from the tip of the nose to the end of the tail.

1.500 kg. measured 51 cm. in length while the tail measured 15 cm. about 40 hours after birth (Acharjyo, *loc. cit.*).

2. African Lion (*Panthera leo*)

Ten cubs born during the period of observation weighed from 0 900 kg. to 1.200 kg., with an average of 1.065 kg , and messured from 50 cm. to 56 cm. in length with an average of 53 cm. while the tail measured from 14.5 cm. to 17 cm. with an average of 15.7 cm. at birth.

Each of the two female cubs at birth measured 21½ inches from the tip of the nose to the tip of the tail and weighed 2 pounds 12 ounces and 3 pounds; another dead male of the same litter weighed 3 pounds 15 ounces (Crandall, *loc. cit*). The African lion cubs at birth are about one foot long and weigh less than a pound (Denis, *loc, cit.*). Acharjyo (*loc. cit*) has given the averarge weight of four African lion cubs as 1.075 kg., the average length as 53.5 cm. and the average length of the tail as 16 cm. at birth.

3. Leopard (*Panthera paadus*)

The weight at birth and size of fourteen leopard cubs observed during this period was as follows: Weight—from 0.400 kg. to 0.585 kg. with an average of 0.518 kg., the length—from 42.5 cm. to 49.5 cm, with an average of 45 cm. and the tail length—from 13.5 cm. to 17 cm. with an average of 15.1 cm.

A single male cub born in the New York Zoological Park, was at birth 14 inches in length and weighed 20 ounces at birth (Crandall, *loc. cit.*). The average weight of six cubs of Nandankanan Biological Park was 0.517 kg., and the average length 44 cm. whereas the average tail length was 14.5 cm. (Acharjyo, *lcc. cit.*).

4. Common Mongoose (*Herpestes edwardsi*)

Two young, including one dead young born n one litter on an average at birth weighed 35 grams and measured 17.5 cm. including the 5.5. cm. long tail.

One young at birth weighed 35 grams, measured 15 cm. in length including the 4 cm. long tail (Acharjyo, *loc. cit.*).

5. Nilgai or Blue bull (*Boselaphus tragocamelus*)

The weight and size at birth of seven young including two dead young born during this period was as follows: Weight—from 5.200 kg. to 8.300 kg. with an average of 6.543 kg., the length—from 84 cm. to 96 cm. with an average of 90.1 cm. and shoulder height—from 52 cm. to 59 cm. with an average of 55.6 cm.

The average weight at birth of three young was 8.070 kg., the average length was 89 cm. and the average shoulder height was 57 cm. (Acharjyo, *loc. cit.*).

6. Black buck (*Antilope cervicapra*)

Twelve black buck young born here during the period of observation weighed at birth from 3.000 kg. to 4.300 kg. with an average of 3.558 kg., measured in length from 65 cm. to 73 cm. with an average of 70.1 cm. and the shoulder height was from 37 cm. to 42 cm. with an average of 39.8 cm.

Acharjyo (*loc. cit.*) reported the average weight of three young as 4.000 kg., the average length as 72 cm. and the average shoulder height as 39 cm. at birth.

7. Four-horned antelope (*Tetracerus quadricornis*)

The four young born in two litters weighed at birth from 1.000 kg. to 1.170 kg. with an average of 1.081 kg., measured 44 cm. to 48 cm. with an average of 46.3 cm. in length and the shoulder height was from 26 cm. to 28 cm. with an average of 27 cm.

Shull (1958) has given the weight of one young as 2¼ pounds, the length as 15 inches and shoulder height as 10 inches, at birth.

8. Sambar (*Cervus unicolor*)

At birth the weight of seventeen sambar fawns born during this period was from 7.600 kg. to 11.000 kg. with an average of 9.653 kg., the length was from 91 cm. to 106 cm. with an average of 98.8 cm. whereas the shoulder height was from 53 cm. to 58 cm. with an average of 55.2 cm.

The average weight of nine fawns at birth was 8.270 kg., the average length 98 cm. and the average shoulder height was 53 cm. (Acharjyo *loc. cit.*).

9. Spotted deer (*Axis axis*)

The weight at birth of tweny-four fawns including three born dead was from 2.200 kg. to 4.000 kg., with an average of 3.129 kg., the length was 65 cm. to 79 cm. with an average of 72.6 cm. and the shoulder height was from 36 cm. to 44 cm. with an average of 39.7 cm.

According to Acharjyo (*loc. cit.*) the average weight of 33 fawns was 3.320 kg., and the average length was 71 cm. and the average shoulder height was 39 cm. at birth.

10. Hog deer (*Axis porcinus*)

The three premature and dead fawns born during this period weighed from 1.100 kg. to 1.500 kg. with an average of 1.333 kg., the length from 48 cm. to 54 cm. with an average of 51.7 cm. Therefore at birth the weight and size of fully developed live fawns are expected to be more than these records.

There is no mention of the weight and size at birth of this species in the available literature.

11. Barking deer (*Muntiacus muntjak*)

At birth the six fawns including one dead fawn weighed from 1.000 kg. to 1.400 kg.

with an average of 1.250 kg., measured from 43 cm. to 53 cm. with an average of 49.1 cm. and the shoulder height was from 22 cm. to 27 cm. with an average of 24.9 cm.

A barking deer fawn weighed from 0.550 kg. to 0.650 kg. at birth (Walker *et. al.*, *loc. cit.*). The average weight and size at birth of nine fawns was given by Acharjyo (*loc. cit.*) as follows: weight, 1.520 kg., the length 50 cm. and the shoulder height, 27 cm.

12. Mouse deer (*Tragulus meminna*)

A female mouse deer fawn born in one litter weighed 203 grams, was 27 cm. in length while the shoulder height was 12.5 cm.

There is no mention of the weight and size at birth of this species in the available literature.

SUMMARY

This paper deals with further observations on birth weight and size of twelve kinds of wild mammals maintained at Nandankanan Biological Park (Orissa) and observed during the period from 1.7.1969 to 30.6.1972. The observations of earlier workers are cited and discussed.

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Law of the Jungle

By

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When there is a break down of the established law, it is usual to describe the development as prevalence of 'Jungle Law' If dacoities are committed, crops are looted and there is a failure of the local administration to an extent in which the citizen is unable to protect his life and property, the law of the jungle is supposed to usurp the place of established code.

That such descriptions of the Law of the Jungle is extremely unfair to the voiceless denizens who reside in them, will be apparent from the following examples of animal behaviour.

Among the lower animals, we know that the social life of bees and ants revolves round a high level of co-operatives in which no one individual has all the benefits from the community's work but all share equally, dividing the activites between them. The egg-laying queen's role is to produce up to fifteen hundred eggs per day and during her life span of two to five years, she controls and co-ordinates the behaviour of the rest of the hive. She produces several thousand sterile females who during their life-expectancy of four to six weeks do nothing else but work selflessly. These are the workers of the hive. The unfertilised eggs develop into a few hundred males or drones whose only function is to mate with the queen; they do not work, and are fed by the workers, till they are turned out of the hive to die.

Alison Maddok in her book, "Animals at peace" says "The individuals do not count in these ruthless insect societies; the good of the colony is the end to which all behaviour is directed". Each caste in the colony does its allotted task ungrudgingly. There are no labour unions and strikes. How many of our co-operative organisations function for the good of the community as a whole, although the bye-laws provide for this laudable basic objective ?

The tolerance and co-operation that exists between many animals in the wild is something Man may envy. Herds of elephant, gaur (commonly known as bison) and deer will graze peacefully together in their natural habitat. When an elephant breaks a bamboo culm or fells a tree, the fallen vegetation provides fodder for the deer and gaur. While one animal provides food, the other offers shleter and protection. Deer herds are seen below trees occupied by monkeys, who pluck fruits from tree branches, eating some and dropping some on the ground for the deer to feed on. If a tiger or any other predator comes in its

vicinity, the monkeys are able to see it first from the tree tops and give the alarm call to alert the animals on the ground. The common langur is an arboreal creature but it spends a good deal of its time on the ground either for drinking water or for shade or for the juveniles to play. A gaur or cheetal can hear and smell an enemy better and in a reverse situation they alert the langurs in case of danger, enabling them to climb trees in safe retreat. Each animal in the forest recognises the danger calls and signal of others and they thus have a mutually effective advance warning system.

To avoid competition for food, different herbivores have acquired different habits. While some are graziers others are browsers; they utilise the whole food supectrum of herbage, foliage, fruit, seeds, bark and roots. There are no food riots in the animal kingdom.

In our society, there is at present a tendency by some not to be followers, and belittle their leaders. Animals in the wild accept leadership in a disciplined manner. A pride of lions, for example, contains several lionesses and juveniles but usually only one mature male lion. As the male cubs grow up, they leave the group voluntarily to avoid jealousy with the leader and form separate prides of their own. They seldom quarrel, as we are known to do in a joint family.

The common langur referred to earlier, has been studied by a naturalist in the Indian jungle. In a troop all the males are arranged in a "Hierarchy of Dominance". Each animal is dominant over all the animals below it in rank but submits to those above. Each monkey in the troop has learned his place and recognises exactly when to give in. A dominant male needs only to approach and perhaps threaten briefly and his subordinate will move out of the way; a stable society is thus maintained.

Even farm-yard hens have a "Straight-line system of Dominance" commonly known as "peak-order". When hens gather at a feeding place, their respective turns at the food are determined by this order, an inferior hen being pecked at if she tries to queue-jump. Contrast this with the behviour of some of our country-men who often gate-crash at railway and cinema counters, and do not queue-up unless forced to.

Rank-orders are known to be the basis of society in several mammals, birds, reptiles and fish. It is something like seniority in our government service hierarchy with the difference that the subordinate animals of the animal kingdom seldom come to blows. When there is a fight it is immediately stopped by the subordinate animal making a gesture of submission in various ways. Some crouch and withdraw their heads and make themselves look smaller in size before the victor. Head-up display has been observed to be an adequate means of asserting dominance without resorting to direct aggression, in cheetal and many ungulates. A gaur bull expresses his dominance, as Schaller has observed, with a lateral display of its impressive dewlaps, which at once is accepted by

weaker males and cows. We public servants are too familiar with the wrangles, ill-will, and lasting indiscipline generated over seniority disputes in the cadre.

It is not to suggest that animals do not fight among themselves. Aggression is at the root of social evolution but fighting rarely does any damage. Males of deer and antelopes engage themselves in "Intra-specific" combats. They fight for the possession of the females in the herd during rutting season. Such fights are seldom fatal; the weaker one submits to the stronger male who takes possession of the harem and being strong propagates a better quality of the race. The weaker males are so to say "psychologically castrated". Is there any such selection mechanism in the human race ?

There is a code of conduct among the carnivores too. A tiger kills only when he is hungry, and usually rhe weaker and inferior animals fall prey to it. Predators exert a natural selective pressure on the prey; for failure by any agency to remove the weak and the deficient from the breeding population gradually saps the vitality of the whole gene pool. Only when Man steps in and destroys the forest habitat and kills the prey animals for trophy and venison, a tiger becomes cattle-lifter killing even the best of cows and buffaloes in adjacent villages and when the entire eco-system is violently upset by biotic factors a tiger even becomes a man eater. Who is to be blamed for this ? Certainly not the tiger.

Animals in the wild are docile by nature and left to themselves, they lead a qutie disciplined life. Predators and prey animals co-exist in a healthy environment. Maddok writes, "Peaceful co-existence is one of the dreams of mankind. But while human beings strive for co-operation and understanding between rival cultures, animal species have long since discovered how to form partnerships and alliances for mutual benefit."

Last year in the Palamau National Park as many as seven persons were trampled to death by an elephant herd. This, as the subsequent investigation proved, was because the villagers had fired country-made guns and crackers on them. This had irritated the herd which took its toll. By intensive propaganda this year the villagers were educated to see the folly of their action and no casualty has occurred. Left to himself an elephant is a genuine non-aggressor and except showing annoyance by knocking down trees and sniffing with the tip of his trunk, means no harm.

In an interesting article, Robert Ardrey has argued convincingly that nature limits the numbers of nearly every species. *Homo Sapiens* are the only exception.

Some animals have a breeding territory and the females are attracted only to a territorial male. While such defined territories do not normally exist in the case of cheetal, I have seen in the peak of rutting season half a dozen or so males with sub-standard antlers herded together; perhaps all members of a club for the "psychologically castrated"—a device to reduce breeding incidence. Deliberate material neglect among lions to limit their

number to the available food is well known. Infant mortality among gaur calves is appreciable. A sizeable percentage is taken by the tiger and it is suspected that a cow gaur is careless in looking after its young-ones; again to limit their numbers to the carrying capacity of their environment.

Biologists are agreed that the great majority of animal species, whether through territorial spacing or sexual inhibition, through infanticide or systematic neglect, succeed in maintaining a stable population.

Our regard for every human life as sacred, Ardrey argues, has aided by modern medicine and biochemistry, has dropped infant mortality like a "rock in a well". Even the genetically afflicted have no restriction on their reproductive rights. If we cannot practise biological mechanisms prevalent in the natural world we should, as Ardrey suggests have mandatory population control to avoid genetic collapse, and human quantity for quality.

Man, who calls himself *sapiens*, the wise one, has grossly abused his all-powerful position. Over-grazing, deforestation, pollution of streams, rivers and lakes—all his doing—have been causing havoc among birds, fishes, reptile and other animals. Ardrey has concluded: "The tragedy and the magnificence of *Homo sapiens* together rise from the same smoky truth that we alone among animal species refuse to acknowledge natural law".

How ill-informed we are about these Jungle Laws ? and how unfair it is in our arrogance to invoke them to describe man's own follies ?

———

मेरी डायरी के पन्नों में कस्तूरी मृग

रामेश्वर बेदी

पन्द्रह जून १९७१ को मेजर जनरल जगन्नाथन से एक बजे हा में भेंट की। वे बड़ी आत्मीयता से मिले। उन्होंने दीवार पर टंगे भूटान के बड़े नक्शे पर उन दर्रों और चोटियों को देखा जहां मैं अभी घूम कर आया था। लगभग एक घण्टे की बातचीत में भूटान के जंगली जीवों की चर्चा होती रही। उन्हें जंगली जीवों के शिकार का अनुभव है।

जनरल ने अपनी कोठी में छोटा-सा चिड़ियाघर बना रखा है। तार जाल के एक घेरे में कस्तूरी मृगों का एक जोड़ा और मुनाल आदि हिमालय के पक्षी रखे हुए हैं। दूसरे बाड़े में एक काकड़ पाला हुआ है। नर कस्तूरी मृग उनके पास एक साल से रह रहा है। भूटान नरेश ने उन्हें यह भेंट में दिया था। इस समय इसकी उम्र डेढ़ बरस की होगी। इस हिसाब से इसका जन्म जनवरी १९७० में हुआ होगा। इसके श्वदन्त (कैनाइन) लगभग डेढ़ इंच बाहर निकल आये हैं। जंगल में मैंने जो पूर्ण वयस्क कस्तूरी मृग देखे हैं यह उनके जैसा ही दीखता है। इसलिये मेरा अन्दाज है कि यह वयस्क हो आया है और सन्तानोत्पादन के क्षम है। उधर, मादा कस्तूरी मृग (शिऊली) छोटी है। वह लगभग पाँच महीने पहले यहाँ लाई गई थी। हा बस्ती से कुछ किलोमीटर नीचे सड़क पर मजदूर काम कर रहे थे। उन्होंने इस शिऊली को सड़क पर देखा। तब यह छोटी-सी बच्ची थी। मजदूर इसे पकड़ने दौड़े। यह भी जान बचाने के लिए भागी। मजदूरों ने तीन तरफ से नाकाबन्दी कर ली, चौथी तरफ हा नदी बह रही थी। जान बचाने के लिए बच्ची ने उसमें छलांग मार दी। उसकी पतली टांगे नदी के तेज वेग को चीर कर उसे पार ले जाने में सशक्त नहीं थीं। मजदूर भी नदी में कूद पड़े और उसे पकड़ लिया। उस समय वह एक महीने की रही होगी। उसका जन्म जनवरी १९७१ में हुआ होगा। इन दो उदाहरणों से अन्दाज होता है कि भूटान की उत्तरी घाटियों में कस्तूरी मृगों का जन्म जनवरी में हुआ करता है। भारत में गढ़वाल हिमालय में मार्च-अप्रैल में इनके बच्चे पैदा होते हैं।

इन दोनों कस्तूरी मृगों को तार जाल के अन्दर घुस कर अध्ययन करने का अवसर मुझे जनरल ने प्रदान किया था। यह घेरा लगभग सौ गज लम्बा और सौ गज चौड़ा होगा। इसके अन्दर उन्होंने रिंगाल, तालीसफर आदि के पहाड़ी झाड़ रोप रखे हैं। नीचे प्राकृतिक घास का मोटा हरा गद्दा बना रखा है जिसमें छोटी-मोटी बूटियां वैसी ही उगती रहती हैं जैसे जंगल में। जगह-जगह चट्टानें स्वाभाविक रूप में पड़ी हुई हैं। भूमि पहाड़ के ढ़लान के माफिक है। दांयें कोने में एक जलधारा प्रविष्ट होती है और झरने की तरफ गिरती हुई मिनिएचर चिड़ियाघर की उत्तरी सीमा के साथ-साथ बह जाती है। पिछवाड़े में एक गुफा-सी बनाई हुई है जिसमें कस्तूरी मृग, चाहें तो, छिप कर बैठ सकते हैं।

बैणा (नर कस्तूरी मृग) और शिऊली एक-दूसरे के प्रति अनासक्त हैं। पन्द्रह जून की दोपहर साढ़े तीन बजे

मैंने शिऊली की उत्तरी सीमा में तारजाल के साथ बैठा देखा। बैणा पश्चिम-दक्षिण कोने में ढांग के ऊपर बैठा था। सूर्य का प्रकाश मध्मम था और जंगली जीवों की फोटोग्राफी करने के लिए मैं सम्यक् रूप से साधन सम्पन्न नहीं था। मेरे सभी टेलीलेन्स नरेश और राकेश ले गये थे। नरेश एयर फोर्स के माउंटेनीयरिंग एक्स्पीडीशन के साथ फोटोग्राफर के रूप में हिमालय गया हुआ था और राजेश गीर वन में भारतीय सिंहों की फोटोग्राफी कर रहा था। इस एसाइनमेण्ट में उसे अमेरिका की नेशनल ज्योग्राफिक मैगजीन के लिये हजारों की संख्या में रंगीन फोटो खींचने थे।

मैंने बिना टेलीलेन्स के ही कस्तूरी मृगों के फोटो लेने की कोशिश की।

दोनों जीवों के स्वभाव में बड़ा अन्तर था। शिऊली सीधी थी और मनुष्य से डरती नहीं थी। हालांकि मैं अजनबी था, वह मेरे पास ही चरती रहती थी। मुझे अपने पास देखकर बैणा उठ खड़ा हुआ और झाड़ियों के पीछे छिप गया। मैं बहुत धीरे-धीरे पेड़ों और झाड़ियों की ओट लेता हुआ उसके पास पहुँचने की कोशिश करने लगा जिससे मेरे रिफ्लेक्स कैमरे के ग्राउण्ड ग्लास में उसके मुख की बड़ी छवि नजर आ सके। मेरी मुख्य दिलचस्पी उसके बाहर निकले हुये दांतों में थी। नर हाथी के दांतों सरीखे इसके दांत बाहर बढ़े हुये थे। मैं दांतों का अधिक-से-अधिक पास से फोटो खींचना चाहता था।

बैणा अत्यधिक शंकालु और चौकन्ना जीव था। उस समय प्रकृति में कितने ही प्रकार के शब्द उठ रहे थे, उन सबके बीच में से मेरे कैमरे के क्लिक करने के मामूली से खटके को उसके चौकन्ने कान पकड़ लेते थे। क्लिक के साथ ही उसका शरीर भी एक बार डर के मारे संकुचित हो जाता था। मैंने सोचा कि डेढ़ साल से मनुष्य के सम्पर्क में रहने पर भी जब यह इतना शंकित रहता है तो प्रकृति में कितना चौकन्ना रहता होगा।

मैं लगभग डेढ़ घण्टे तार जाल के अन्दर रहा और उसके फोटो लेने की कोशिश करता रहा। वह अक्सर किसी झाड़ी के पीछे छिपता रहा। बीच-बीच में वह घास-पात भी खाने लगता था। हिमालय में ऊँचे पहाड़ों पर उगने वाले पेड़ों के ऊपर सफेद रंग की काई सरीखी झालरें लटकी रहती हैं जिन्हें बौटनी शास्त्र में ऊस्नेआ (Usnea) कहते हैं। इसे वह खूब खा रहा था। शिऊली को भी मैंने उस्नेआ खाते हुए देखा था। चार बजे के लगभग बैणा ने जलधारा में से पानी पिया। एक बार कुछ घूँट भरने के बाद उसने गर्दन ऊपर उठाई और मुझे देखने लगा। इस तरह ठहर-ठहर कर उसने तीन-चार बार पानी पिया।

साढ़े चार बजे के लगभग बैणा ने पूर्वी सीमा पर तारजाल के पास पेशाब किया। उसके पन्द्रह मिनट बाद करीब उसी जगह पर शिऊली ने मूत्र विसर्जित किया। इस जगह से तीन कदम हटकर मींगनियों की दो ढेरियां पड़ी थीं। दोनों कस्तूरी मृग सदा इसी जगह मींगनी करते थे। तारजाल के घेरे के अन्दर किसी भी अन्य जगह नहीं। प्रकृति में रहने वाले कस्तूरी मृगों की भी यही आदतें हुआ करती हैं।

दूसरे हिरण जो कुछ खाते हैं वही इनका आहार था। हर तरह की घास पात, रिंगाल के पत्ते और उस्नेआ वे खा रहे थे। गेहूँ और चावल आधा-आधा किलो हर रोज बाड़े के अन्दर डाल दिये जाते थे। उन्हें दोनों कस्तूरी मृग तथा बाड़े में रहने वाले पक्षी भी खाते थे। पक्षी और कस्तूरी हिरण एक-दूसरे से डरते नहीं थे। सब मिलजुल कर खाते थे और साथ-साथ घास चरते थे।

बैणा अपनी बिरादरी के जानवरों का साथ पसन्द नहीं करता था। एक बार एक काकड़ उसी बाड़े के अन्दर रख दिया गया। जनरल ने सोचा कि वह हिरण भी बैणा के करीब-करीब बराबर उम्र का है इसलिए ये आपस में मेलजोल से रह जाएँगे। उन दिनों उनके पास दूसरा बाड़ा भी नहीं था जिसमें काकड़ को रखा जा सके। अपने राज्य में काकड़ को देखकर बैणा को गुस्सा आ गया। अपने शिकारी दांतों (कैनाइन) से उसने काकड़ पर हमला कर दिया। ये दांत पीछे तथा नीचे की तरफ मुड़े रहते हैं। चोट करने के लिये बैणा अपनी गर्दन को ऊपर उठाता, इससे दांत की नोक ऊपर आ जाती, तब वह मुख को जोर से नीचे मारता, उसका निशाना काकड़ की बक्खी थी। प्रहार करने में उसकी गतियाँ वैसी ही थीं जैसे कुदाल से धरती को फाड़ने के लिए मजदूर के हाथ चलते हैं। डेढ़ इंची सफेद दांतों ने सचमुच अपनी कारगुजारी दिखा दी। काकड़ की बक्खियाँ बुरी तरह फट्टड़ हो गई। उसे बैणा के बाड़े से निकाल कर अलग रखना पड़ा। वह मर गया।

ग्यारह जून, १९७१। कम्पाला (४,३५० मीटर) दर्रे से लौटते हुए हम लोग पैदल चल रहे थे। ढलानों पर से ऐसी तेजी से उत्तर रहे थे कि हर आदमी दौड़ रहा था। घास में छिप गई पगडण्डियों पर लोग एक-दूसरे से बिछुड़ गये। मैं और फौरेस्ट गार्ड स्त्रिङ् एक साथ चल रहे थे। शिखर से ज्यों-ज्यों नीचे उतरते जाते बादल छितराते जाते थे। मोरेन को हमने बिना कठिनाई के पार कर लिया। आसमान साफ हो गया था। सूरज तो नहीं निकला था, पर उसका प्रकाश उजला हो गया था।

एल्पाईन मीडो के अन्तिम ढलानों पर हम पहुँच गये थे। स्त्रिङ् ने मुझे धीरे से कहा—'सर !'

उसकी अंगुली जिधर इशारा कर रही थी उधर मैंने देखा। एक कस्तूरी मृग मेरे सामने दो-ढाई सौ गज की दूरी पर खड़ा था। हमें देखकर वह भागने लगा। वह कुछ कदम भागता और रुक कर गरदन पीछे घुमाता, फिर हमें देख लेता। तीन या चार बार उसने ऐसा किया। उसके बाद उसने चौकड़ी भरी और ढलान के दूसरी तरफ ओझल हो गया। एक फर्लांग के फासले पर वृक्षों की सीमा शुरू हो जाती थी। तालीसफर (एबीस पिण्ड्रो) के ऊंचे वृक्षों के नीचे लगी हुई झाड़ियों के अन्दर वह गायब हो गया। उसकी मींगनी का एक ढेर मैंने ढलान पर देखा था। इससे पता चलता था कि उसकी रिहाइश तालीसफर के इसी जंगल में थी और उसकी भोज्य स्थली वही चरागाह थी। मैंने अपनी कलाई पर देखा। एक बज रहा था। यह ढलान समुद्र तल से लगभग साढ़े तेरह हजार फीट की ऊंचाई पर था।

चौदह जून, १९७१। हा ला दर्रे (४,२२० मीटर) से तीन किलोमीटर नीचे उतर कर हमें सड़क के नीचे दायीं तरफ तीन-चार सौ गज की दूरी पर दो कस्तूरी मृग दिखाई दिए। हमें देखकर नर झाड़ियों में छिप गया। मादा एक चट्टान के पास खड़ी रही। लगभग डेढ़ मिनट तक वह हमें देखती रही। पहले कुछ क्षणों के बाद वह चट्टान के ऊपर चढ़ गई। डिविजनल फौरेस्ट ऑफिसर चैंकप दौर्जी ने थैले में से कैमरा निकाला, ऐपर्चर सैट करके दो फोटो लिए। शिऊली वहीं एक ही पौज में खड़ी हुई मुझे देखती रही। दौर्जी ने अधिक पास जाकर उसके फोटो लेने की सोची। वे कैमरा लेकर नीचे उतरे। तीस कदम गये होंगे, वह भागकर तालीसफर के जंगल में चली गई। वहाँ लगभग तीन सौ मीटर लम्बी और दो सौ मीटर चौड़ी खुली जगह थी जिसके अन्दर दारुहल्दी की दो चार झाड़ियाँ, रुमेक्स के पौधे तथा छोटे फूल और घास उगे हुए थे। ये कस्तूरी मृग इसी घास-पात व फूलों को चर रहे थे। करीब एक बजे का समय था। आसमान साफ नहीं था। लगातार बून्दाबान्दी हो रही थी। हमारे सामने

एक बार शिऊली ने अपने बदन को हिलाकर बालों में से पानी को झाड़ा था। भागने के बाद दस-पन्द्रह कदमों के बाद वह एक बार रुकी और फिर जंगल में गायब हो गई। मेरे हर्बल एक्स्पडीशन में उस समय चौदह व्यक्तियों और दस खच्चरों का फासला था। हम सब सड़क पर रुक कर शिऊली को देखते रहे थे।

छह जून से बारह जून तक के छह दिनों के दौरे में हम लोगों ने तीन बार कस्तूरी मृगों को जोड़ों में देखा और दो बार अकेला देखा। जो मृग अकेले देखे गये उनकी मादा भी सम्भवतः कहीं पास चर रही होगी। नर और मादा के एक साथ मिलने से अन्दाज होता है कि यह समय इनके जोड़े बनाने का मौसम है।

भूटानी शिकारी कस्तूरी मृग को लाटा कहते हैं। इस शब्द का अर्थ मूर्ख है। वे कहते हैं कि यह बिल्कुल मूर्ख प्राणी है और इसे गोली से मार गिराना बहुत आसान है। भूटान में कस्तूरी मृग का शिकार करना मना है। नरेश के अलावा कोई भी इसे नहीं मार सकता। यहाँ के लोग बताते हैं कि नरेश के भण्डार में बड़ी संख्या में कस्तूरी के नाफों का स्टौक रहता है। वे तोहफे के रूप में अपने मेहमानों को कस्तूरी देकर उनका सम्मान करते हैं। थिम्फू में भूटानी वैद्य की एक डिसपेन्सरी है। देशी जड़ी-बूटियों के द्वारा इलाज करने वाले को भूटानी में टुन्सो कहते हैं। इस डिस्पेन्सरी के टुन्सो ने मुझे वह कस्तूरी दिखाई थी जो उसे भूटान नरेश ने दी थी। भूटानी में कस्तूरी को लाची, नाफे को तियू, नर कस्तूरी मृग को फो और मादा कस्तूरी मृग को मोह कहते हैं।

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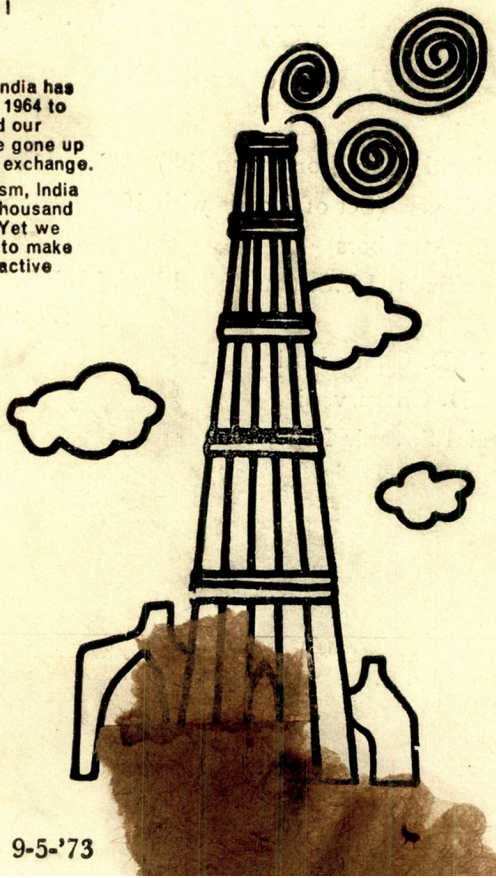

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